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JACOBS ENGINEERING GROUP INC.
ENVIRONMENTAL SYSTEMS DIVISION

IN ASSOCIATION WITH:
TETRA TECH
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BATTELLE PACIFIC NORTHWEST LABORATORIES
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U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL ENFORCEMENT SUPPORT
AT
HAZARDOUS WASTE SITES

TES IV
CONTRACT #68-01-7351
WORK ASSIGNMENT NO. 646

DRAFT REPORT
RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

RIDGEFIELD BRICK AND TILE
PACIFIC WOOD TREATING
RIDGEFIELD, WASHINGTON
U.S. EPA REGION X

TETRA TECH, INC.
FOR
JACOBS ENGINEERING GROUP, INC.
PROJECT NUMBER: 05-B646-00
TC-3621-17

JANUARY 1989

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EXECUTIVE SUMMARY

The primary purpose of this comprehensive groundwater monitoring evaluation (CME) is to assess Pacific Wood Treating's (PWT) compliance with the requirements of the 21 November 1986 Consent Agreement and Final Order issued by U.S. EPA Region X. The Consent Agreement ~~cites PWT for illegal disposal~~ of the RCRA-listed waste K001 (generated at PWT's facility) at the Ridgefield Brick and Tile (RBT) landfill site. The Final Order delineates several activities required of PWT in order to comply with applicable RCRA regulations. The major requirement of the Final Order was to install a groundwater monitoring system to monitor the uppermost aquifer beneath the landfill. change

The RBT/PWT CME included a review of available information concerning the RBT landfill, local hydrogeology, and the groundwater monitoring system. A site investigation and sampling visit was also conducted to evaluate PWTs sampling procedures and collect split samples for independent analysis.

The major deficiency in PWT's efforts is that they have not clearly identified the uppermost aquifer beneath the landfill. The shallow sand layer, which PWT's groundwater monitoring system is designed to monitor, will serve as an adequate aquifer for the purposes of detecting releases from the landfill only if there is enough water in it to monitor. Data presented to date do not indicate that this is the case. The hydrology of the shallow alluvial sediments and any hydraulic connection to the deeper regional aquifer ~~should~~ have not been ~~must be fully~~ characterized. If it cannot be demonstrated that representative groundwater samples can be obtained from the shallow sand layer, federal regulations [40 CFR 265.91(a)] require that another monitoring system be installed in the deeper regional aquifer. They are subject to 265 detection monitoring requirements only not 270.14(c)

An evaluation of the details of the monitoring system was not performed because it does not appear that the monitoring system was completed in the uppermost aquifer as required. Because the sampling and analysis plan used by PWT is inadequate, it should be revised to include the level of detail recommended in the RCRA Groundwater Monitoring Technical Enforcement Guidance Document (U.S. EPA 1986a).

RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION
RIDGEFIELD BRICK AND TILE/PACIFIC WOOD TREATING LANDFILL
RIDGEFIELD, WASHINGTON

1.0 INTRODUCTION

Tetra Tech, Inc., under the U.S. Environmental Protection Agency (EPA) Technical Enforcement Support contract, has conducted a Resource Conservation and Recovery Act (RCRA) Comprehensive Groundwater Monitoring Evaluation (CME) at the Ridgefield Brick and Tile/Pacific Wood Treating landfill near Ridgefield, WA. The CME was performed to determine the facility's compliance with the Consent Agreement and Final Order (U.S. EPA 1986c), RCRA interim status groundwater monitoring requirements (40 CFR 265 Subpart F), ~~and RCRA permit requirements [40 CFR 270.14(c)]~~. A site inspection and sampling visit was conducted at the facility on 23 May 1988. no part B involved

Evaluation of facility compliance with the Consent Agreement and Final Order and applicable regulations, and determination of technical adequacy of the groundwater monitoring system design and operation was conducted with reference to 40 CFR 265 ~~and 270~~, the Final RCRA Comprehensive Groundwater Monitoring Evaluation Guidance Document (U.S. EPA 1986b), and the RCRA Groundwater Monitoring Technical Enforcement Guidance Document (U.S. EPA 1986a).

2.0 BACKGROUND

2.1 Facility History

The Ridgefield Brick and Tile (RBT) landfill is located on the south side of 289th Street approximately 2 mi east-northeast of the City of Ridgefield, WA (see Figure 1). The 5.5 ac site, originally owned by Elmer Muffet of RBT, contains a warehouse/manufacturing building on the western

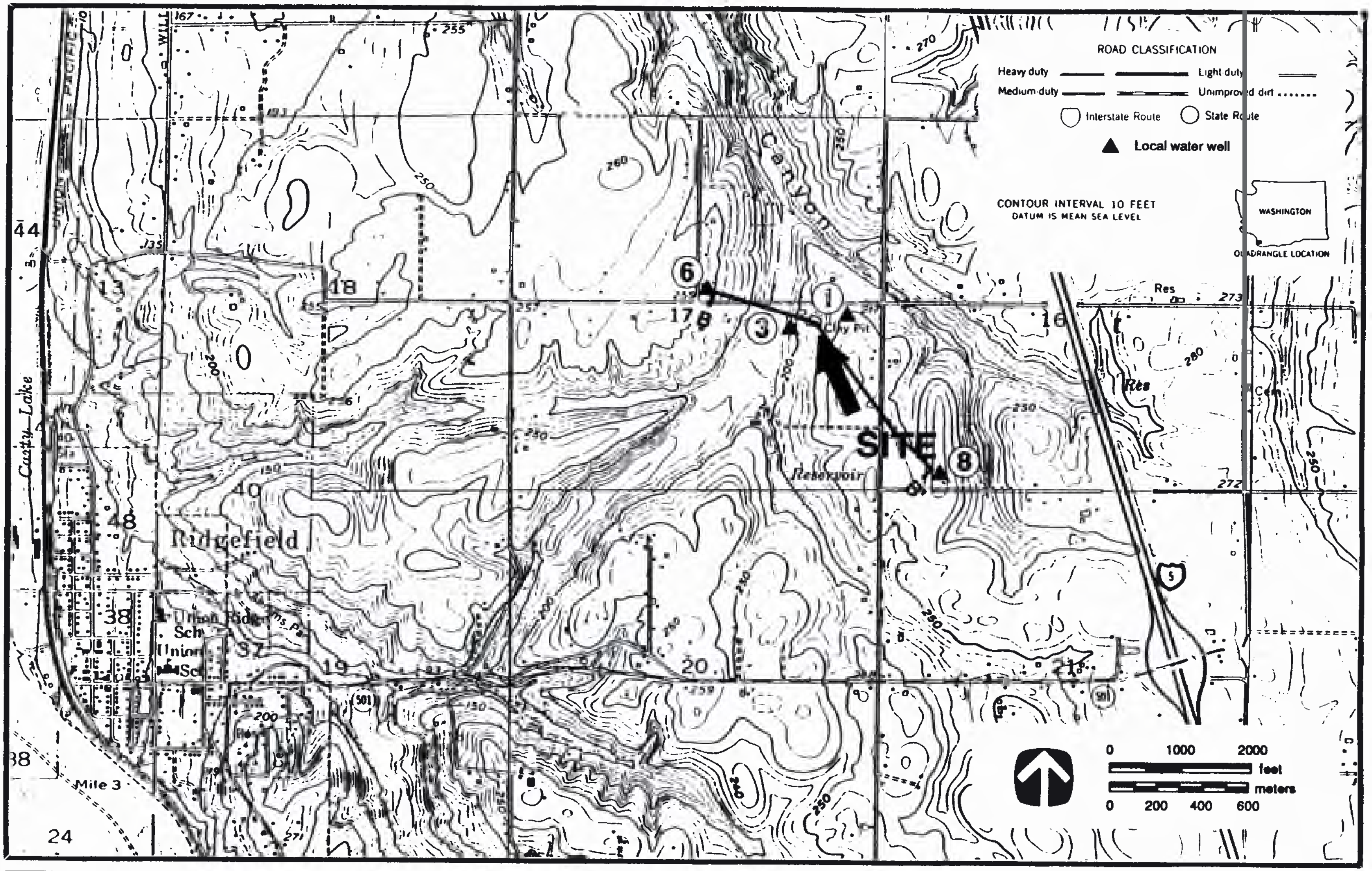


Figure 1. Vicinity map and orientation of cross-section B-B'.

portion of the site and a clay pit. The area north of the clay pit was reportedly used as a dump area (Hazard Management Specialists 1987b).

Pacific Wood Treating (PWT) operates a wood preservation facility at another location in Ridgefield, WA. The facility uses pentachlorophenol, creosote, and chrome/copper/arsenic (CCA) solutions as preservatives. In 1979, PWT began using the RBT landfill site for disposal of log deck and yard cleanup waste and boiler ash. From 1979 until 25 January 1983, PWT disposed of approximately 7,600 yd^3 of waste at the landfill (U.S. EPA 1986c).

PWT burns approximately 20 million lb/yr of wood in ~~their~~ its boiler, and from 1979 to 1982 burned 32,000 lb/yr of wastewater sludge. Because ash production from the wood is approximately 3 percent, approximately 2.5 million lb (or 2,500 yd^3) of ash was generated and disposed of at the RBT landfill between 1979 and 1983 (Hazard Management Specialists 1987b). Of this quantity, only 5,000 lb (or 5 yd^3) are the result of wastewater sludge incineration. However, this wastewater sludge is designated as K001 (creosote/pentachlorophenol wastewater treatment sludge) and D004 (arsenic) hazardous waste. Because the wastewater sludge is RCRA-listed waste (i.e., K001), all ash derived from the incineration of the sludge, and all solid waste (e.g., boiler ash) mixed with a K001-listed waste will retain the K001 hazardous waste listing.

PWT used an incinerator for the treatment of the K001 sludge. This incinerator was classified as a RCRA treatment unit and required an operating permit. During an inspection of the facility by U.S. EPA and the Washington Department of Ecology (Ecology), it was discovered that PWT was disposing of its incinerator ash in an unpermitted landfill. PWT had assumed that the ash generated during the incineration was no longer hazardous and could be disposed of in an unregulated landfill.

Subsequent to the U.S. EPA inspection, PWT began closure activities for the landfill in September 1983 (Wicks 1984). The closure, reportedly supervised by Ecology personnel, included the following activities:

- Preliminary sampling of soil and water.

- Draining the old clay pit and constructing a wedge shaped landfill cell. The cell comprised a compacted soil and soil/bentonite liner and was equipped with subsurface drains.

- Transferring all wastes into the cell, in compacted 18-in lifts, and covering the cell with a compacted clay cap.

The RBT landfill is approximately 0.75 ac (180 ft^2) and the surface slopes from east to west (Figure 2; Attachment A, Photos 3 and 4). Surface water runon and runoff controls are in place and the surface of the cell has been revegetated. Closure activities were completed in January 1984.

On several occasions since the original closure of the landfill, PWT has monitored local water supply wells, onsite lysimeters and wells, and drainage collected from the subsurface drains. Concentrations of pentachlorophenol and naphthalene (when detected at all) have typically been below 2 ug/L and always below 10 ug/L. Metals concentrations have typically been below drinking water standards for chromium and arsenic.

2.2 Regulatory History

The regulatory history for the RBT landfill began when the site was discovered during a U.S. EPA inspection of the PWT plant. PWT submitted a RCRA Part A hazardous waste permit for the landfill on 23 May 1983. At that time, the landfill became an interim status disposal facility and was subject to the relevant sections of RCRA, including the Hazardous and Solid Waste Amendments of 1984, and State of Washington dangerous waste regulations found in WAC-173-303.

PWT submitted a closure plan for the landfill to Ecology and conducted the closure in late 1983. However, the closure plan did not include

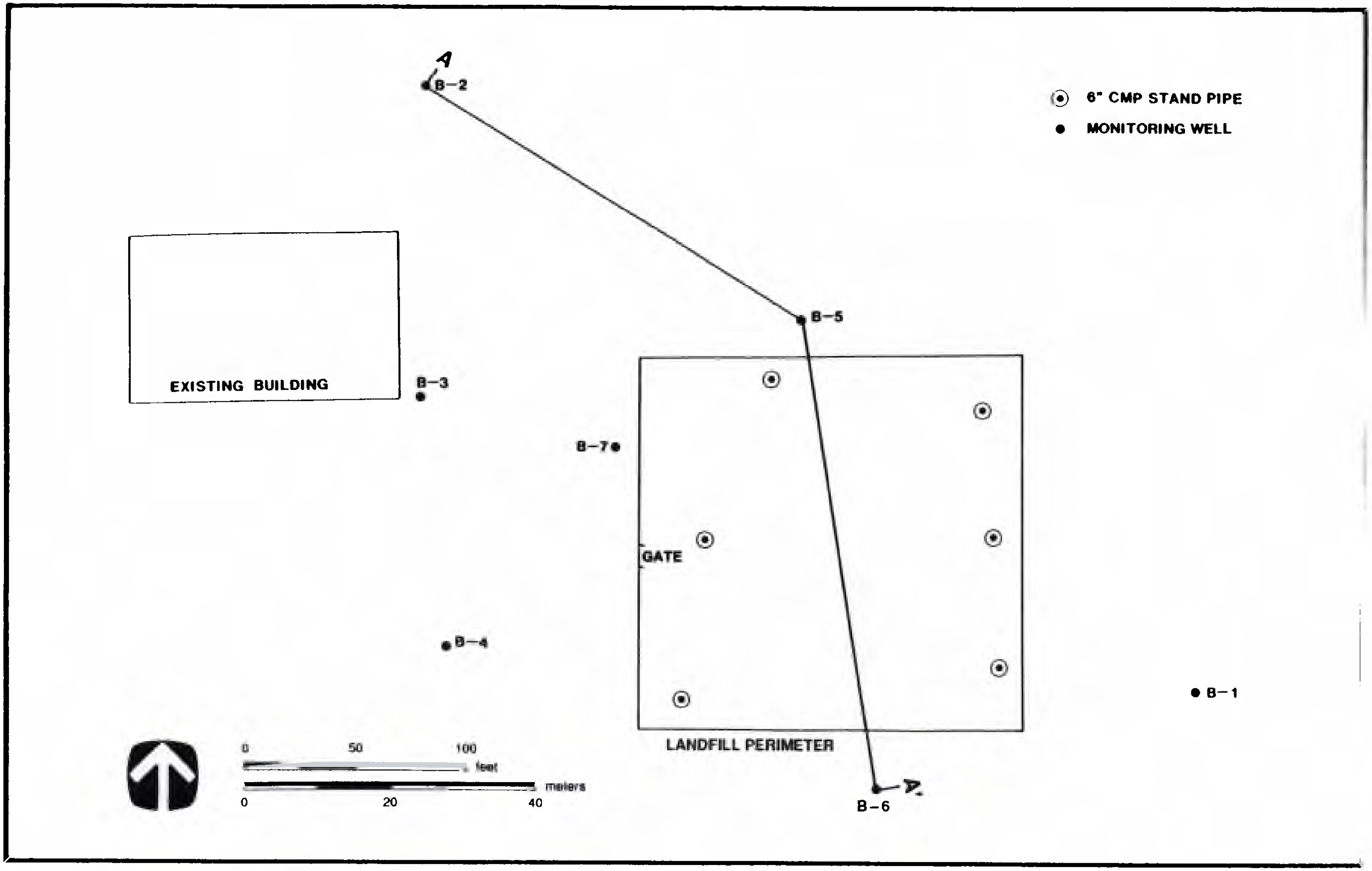


Figure 2. Site map, monitoring well location, and orientation of cross-section A-A'.

provisions for groundwater monitoring as required by 40 CFR 265 Subpart F and did not address post-closure care and financial assurance requirements.

As a result of these deficiencies in the closure of the landfill, U.S. EPA Region X issued a Consent Agreement and Final Order on 21 November 1986 citing PWT in violation of several federal regulations including:

- Generator recordkeeping requirements in 40 CFR 262.10(b)

- Requirements in 40 CFR 264, 265, and 270 regarding the management of leachate collected from the landfill as hazardous waste

- Groundwater monitoring requirements in 40 CFR 265.90-94 and 265.310(b)

- Financial assurance requirements in 40 CFR 265.145.

The Consent Agreement and Final Order required PWT to address the violations cited above including the submittal of a revised closure plan meeting the requirements of 40 CFR Subpart G and installation of a groundwater monitoring system.

PWT submitted the required closure plan to U.S. EPA Region X on 19 February 1987 (Hazard Management Specialists February 1987a). In ~~conjunction with~~ addition to the closure activities, PWT submitted to EPA HQ ~~a~~ delisting petition and supporting groundwater monitoring data in an attempt to delist the contents of the landfill. When this CME report was prepared, the delisting petition procedure had not been processed and the landfill still contains RCRA-regulated waste.

not relevant - delete

In June 1987, U.S. EPA Region X provided PWT with their comments on the revised closure plan (Feigner, K.D., 15 June 1987, personal communication). The following deficiencies were noted:

- Hydrogeologic characterization requirements of 40 CFR 270.14(c) were not addressed

- The proposed groundwater monitoring program did not meet the requirements of 40 CFR 265.90(a) regarding monitoring the uppermost saturated zone

- The analytical parameters to be included in the quarterly monitoring schedule did not meet the requirements of 40 CFR 265.92 and 265.93.

U.S. EPA Region X requested that the deficiencies in the closure plan be addressed and that a revised version be submitted. A revised plan was not submitted as of early 1989. However, a groundwater monitoring system was installed in August 1988.

2.3 Hydrogeology

2.3.1 Regional Geology--

The geology of the area surrounding the RBT landfill is shown in Figure 3 and described below by Hazard Management Specialists (1987b).

> "The upland areas near the RBT site are reportedly underlain by Quaternary alluvial deposits including deltaic gravels, sands, and silts. Underlying this unit is the Tertiary Troutdale formation which is effectively ubiquitous to Clark County. The upper member of the Troutdale generally includes cemented sand and gravel while the lower member is predominantly finer grained silts and clays. Mundorff (1964) maps the Troutdale as cropping out in the canyon west of the RBT site as well as Allen Canyon to the north and northwest.

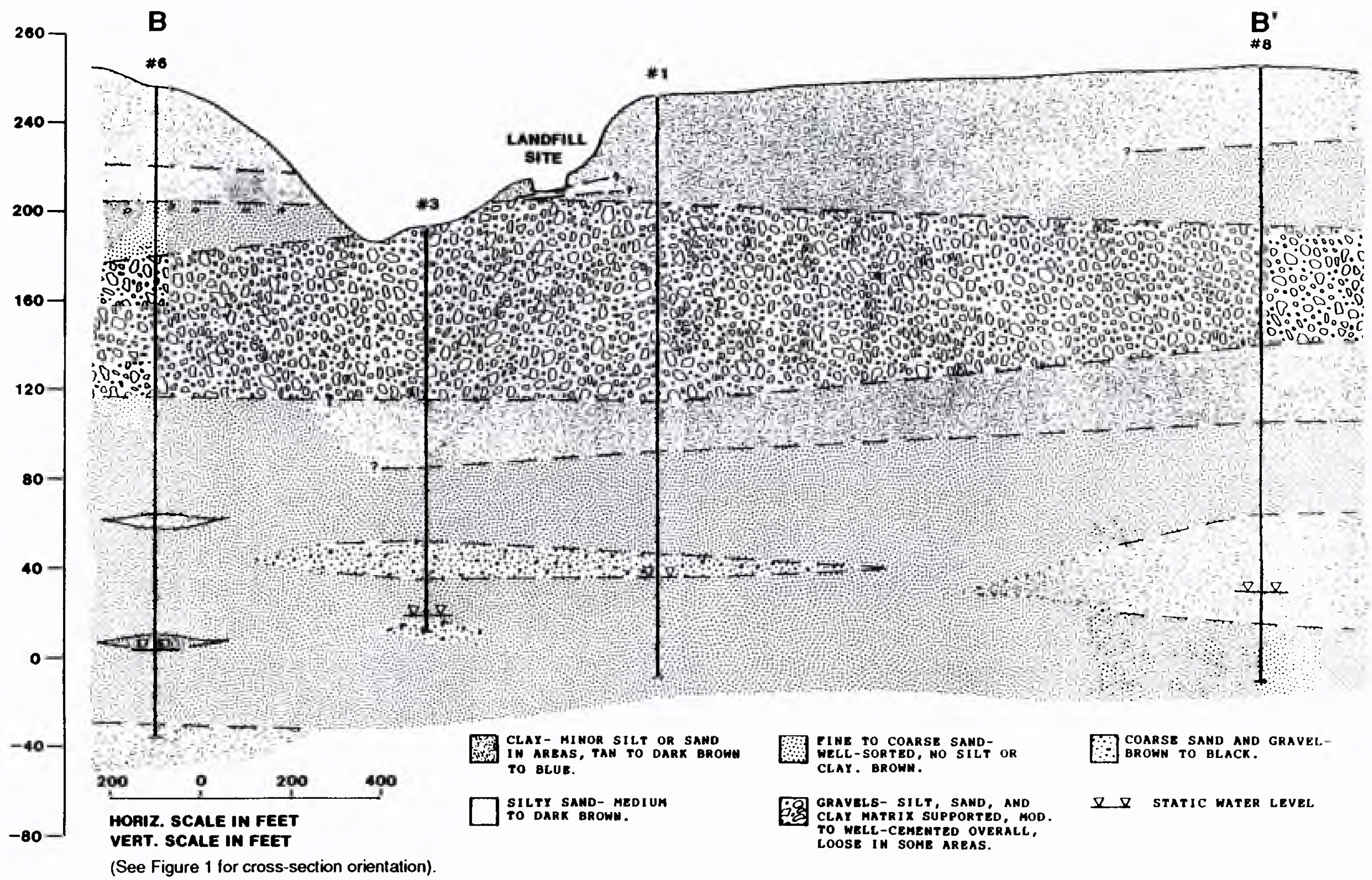


Figure 3. Regional cross-section B-B'.

"The irregular surface of the Troutdale . . . indicates the deltaic unit [described above] unconformably overlies the Troutdale. The weathered surface of the Troutdale may result in locally perched ground water. This is supported by reports of sporadic success in obtaining small quantities of water from shallow dug wells."

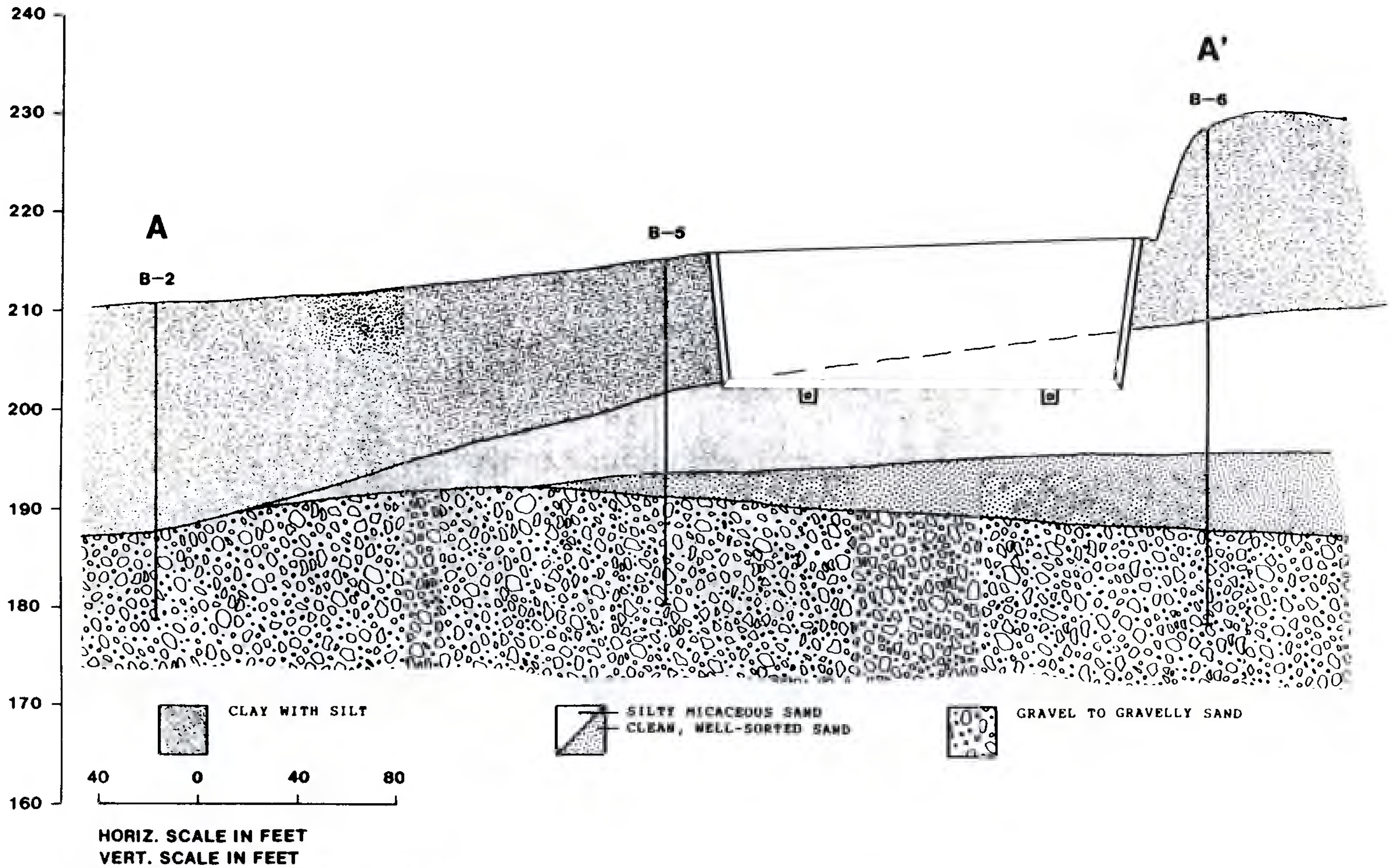
2.3.2 Site Hydrogeology--

The site-specific geology at the RBT landfill site is consistent with the regional geology described above. The upper stratigraphic units are Quaternary alluvial sands, silts, and clays. The lower units are members of the Tertiary Troutdale Formation. There are currently seven monitoring wells and three lysimeters in place at the RBT landfill site.

As shown in Figure 4, the upper 10-25 ft of sediment at the site consists of a clayey silt or silty clay. This unit was nearly saturated (88-100 percent) and had a permeability of 1.5×10^{-6} cm/sec as measured in a laboratory constant head permeability test (David J. Newton Associates 1987). This clayey silt unit was reported in all seven monitoring wells installed around the landfill.

In Wells B-1, B-5, B-6, and B-7, a sand unit was observed immediately below the clayey silt. This sand unit appeared to pinch out west of the landfill and became thicker to the east. This unit comprised two facies. The upper facies was a silty, clayey sand with an estimated permeability of between 10^{-5} and 10^{-3} cm/sec. This facies was fairly wet (60-90 percent saturation) and was up to 14 ft thick in Well B-1. The lower sand facies was a relatively clean, well-sorted sand with an estimated permeability of 10^{-3} to 10^{-2} cm/sec. This facies was less saturated (40-50 percent) in the upper and middle portions of the facies, while up to 75 percent saturated near the bottom of the facies (David J. Newton Associates 1987).

PWT has postulated that a seasonal perched water table exists in the sand unit and has installed their groundwater monitoring system in it. Data



(See Figure 2 for cross-section orientation).

Figure 4. Cross-section A-A'.

gathered by PWT to date have not confirmed the presence of this perched zone and the hydrology of the sands is not well defined.

The upper member of the Troutdale Formation is found beneath the alluvial deposits described above and consists of weathered gravel described by David J. Newton Associates (1987):

> "The gravel cores indicate that the clasts are rounded, generally in the 0.5 to 1.5 inch size range, and are weathered. Some clasts could be broken by finger pressure.
>
> "The clasts are fully supported in a silt, clay, and sand matrix with a dense, coherent fabric. Grain size analyses indicate the samples actually class as a silty sand. . . . Moisture content tests indicate that the degree of saturation for the gravel samples range from 60 to 80 percent. . . . Three core samples were tested for permeability at vertical and lateral confining pressures representative of field conditions. The test results indicate permeability values of 9.03×10^{-6}, 2.6×10^{-5}, and 7.01×10^{-5} cm/s."

Lower members of the Troutdale Formation consist of sands and gravels with intermittent clay and silt beds (see Figure 3). The main regional aquifer is located in the lower Troutdale at depths beneath the landfill of approximately 180-220 ft. Although groundwater flow in this aquifer is generally to the northwest, a detailed evaluation of the flow characteristics beneath the RBT site has not been made.

3.0 SITE INSPECTION

On 23 May 1988, Mr. Kurt Schmierer and Mr. Brian O'Neal of Tetra Tech conducted a site inspection and sampling visit at the RBT landfill. The site inspection date had been previously arranged with Dr. Bryant Adams of PWT.

The inspectors met with Dr. Adams and Mr. David Newton, a consultant to PWT, at 1035 h on 23 May 1988. The inspectors explained that the purpose of the inspection was to conduct a CME and that groundwater sample splits and photographs would be taken. Dr. Adams showed the inspectors the landfill site and pointed out the monitoring wells, lysimeters, and surface water control ditches. At each well, Mr. Newton and Dr. Adams measured the depth to water and/or the bottom of the well. The only well that had more than 1 in of water was Well B-5 which had approximately 6 in of water. Because the levels of water in these wells was so low, sampling was not conducted.

After all wells were inspected, Dr. Adams unlocked the gate to the landfill and showed the inspectors the toe drain located on the west edge of the landfill. The toe drain consists of an 8-ft section of steel pipe, approximately 3 ft in diameter (Attachment A, Photo 14). At the time of the inspection, the toe drain was approximately half full of water. The inspectors decided to collect their samples from the toe drain as none of the wells had a sufficient amount of water to sample. The plan was to sample the water standing in the toe drain, then purge the drain and sample from the inlet to the drain near the bottom of the pipe.

After preparing the sample bottles and decontaminating the bailer, the inspectors collected a sample from the drain without purging the toe drain. This sample was collected in triplicate for analysis of matrix spike and matrix spike duplicate samples. When all three sets of sample bottles were filled, Dr. Adams and Mr. Newton set up a small pump to purge the toe drain so that a sample could be collected from the inlet (Attachment A, Photo 16). The water removed from the toe drain was pumped into a small earthen impoundment located 20 ft north of the drain (Attachment A, Photo 17). When the water level was dropped to the level of the inlet, it was evident that a significant flow of water was discharging to the toe drain. Dr. Adams suggested that this flow was probably the subsurface drain lines emptying into the drain because of the reduced head caused by the pumping. The air inside the toe drain was monitored for volatile organic vapors during pumping with a photoionization detector, and no readings above background were observed.

To collect the sample from the inlet, a ladder was lowered into the toe drain and Mr. Schmierer climbed down into the pipe to collect the samples. The volatile organic sample had to be collected from a plastic bucket (decontaminated before use) that was filled at the inlet because the discharge from the inlet was too fast to collect a relatively unaerated sample directly into the sample bottle. The remainder of the sample bottles were filled directly from the inlet for analyses of chlorophenols, polynuclear aromatic hydrocarbons (PAHs), and metals, respectively.

After the inspectors finished sampling, Dr. Adams and Mr. Newton collected their samples by lowering the bucket down into the drain, filling it from the inlet, and filling the sample bottles from the bucket with the aid of a funnel (Attachment A, Photo 18). The inspectors then decontaminated the bailer and collected a rinsate blank using deionized water.

When all the samples were collected and placed on ice, Dr. Adams showed the inspectors the tank in which leachate from the toe drain is collected (Attachment A, Photo 19). The inspectors then requested a copy of PWT's sampling and analysis plan (see Attachment B), which was provided by Dr. Adams. The inspectors left the site at approximately 1430 h.

4.0 COMPLIANCE WITH CONSENT AGREEMENT AND FINAL ORDER

As previously described in Section 2.2, U.S. EPA Region X issued a Consent Agreement and Final Order to PWT on 21 November 1986. The Consent Agreement and Final Order cited violations of several federal regulations and described activities that PWT would be required to initiate and successfully complete to avoid monetary penalties. The compliance activities delineated in the Consent Agreement and Final Order include:

- Submittal of documentation demonstrating the lawful management and disposal of leachate collected from RBT landfill

- Demonstration of compliance with the financial assurance requirements of 40 CFR 265 Subpart H

- Submittal of a closure plan meeting the requirements of 40 CFR 265 Subpart G which shall address:

  - Soil sampling to determine whether any releases of hazardous substances have occurred from the leachate collection system (i.e., toe drain, drain lines)

  - Installation of a groundwater monitoring system at the landfill that complies with 40 CFR 265 Subpart F

  - Provide sufficient hydrogeological information to satisfy the requirements of 40 CFR 270.14(c).

Because the intent of this CME is to assess PWT's compliance with the requirements listed above, this report focuses on PWT's activities and documents associated with the closure of the landfill and installation of a groundwater monitoring system. For reasons described in Section 4.3.2, a detailed analysis of PWT's groundwater monitoring system is currently not possible. The following sections address the six requirements of the Consent Agreement and Final Order in the order listed above.

4.1 Documentation Of Lawful Management and Disposal of Landfill Leachate

Since January 1986, PWT has contracted with Crosby and Overton, Inc. of Kent, Washington to empty the leachate collection tank (Adams, B., 5 January 1989, personal communication). The tank has reportedly been emptied four times since January 1986; each time approximately 900 gal of leachate was taken by Crosby and Overton for treatment and disposal at their Kent facility.

4.2 Compliance With Financial Assurance Requirements

No documentation concerning the status of PWT's financial assurance mechanism was available at the time this report was written. However, PWT set up a joint depository account at Rainier (now Security Pacific) Bank with PWT and U.S. EPA as co-signees on the account. Information concerning the current status of this account has been requested from Rainier (Security Pacific) Bank. According to the bank, the account contained $13,291.53 on 3/27/89.

4.3 Submittal of RCRA Closure Plan

PWT submitted the required closure plan to U.S. EPA on 19 February 1987. On 15 June 1987, U.S. EPA submitted their comments on the closure plan citing several deficiencies and requesting that a revised plan be resubmitted to address U.S. EPA's concerns (Feigner, K.D., 15 June 1987, personal communication). A revised plan was not submitted by PWT, but closure activities i.e., gwm occurred later in 1987. Sections 4.3.1, 4.3.2, and 4.3.3 provide an evaluation of how well PWT closure activities comply with the requirements of U.S. EPA's Consent Agreement and Final Order.

4.3.1 Soil Sampling--

During the installation of the groundwater monitoring system (see Section 4.3.2), several additional soil borings were drilled and samples collected and subsequently analyzed for pentachlorophenol, naphthalene, copper, chromium, and arsenic (Adams, B., 3 December 1987, personal communication). Results of the analyses indicate that pentachlorophenol and naphthalene were below detection limits (17 ppb and 140 ppb, respectively) and that metal concentrations were at or below levels found in background samples. However, the samples appear to have been composited over the upper 6 ft of soil, and no rationale for this sampling strategy was provided. Compositing soil samples over 6 ft may result in dilution of contaminants, especially when looking for surface contamination. No other information on sample collection, handling, or analysis was available to validate the analytical results.

4.3.2 Groundwater Monitoring System Installation--

PWT installed seven groundwater monitoring wells around the RBT landfill from 24 to 28 August 1988. These wells were installed in the shallow sand layer found beneath much of the site. PWT postulated that a saturated zone existed, at least seasonally, in this relatively permeable sand and that by monitoring this proposed upper saturated zone, releases from the landfill could be detected. However, as of January 1989, PWT has only collected one groundwater sample because the water levels in the monitoring wells are too low. The results of the single groundwater sample are discussed in Section 5.0 of this report.

Federal regulation 40 CFR 265.91(a) requires that the groundwater monitoring system allows adequate monitoring of the uppermost aquifer beneath the facility. PWT has not demonstrated that the current system is capable of meeting this requirement. There are two possible reasons for this inability to adequately monitor the sand layer: 1) the sand layer does not contain enough water to monitor, or 2) the current system is not constructed or operated in such a way as to monitor the water that may be present.

If the level of water is insufficient for monitoring purposes and is the reason for the system failure, regulations require that a new monitoring system be installed in the uppermost aquifer (i.e., the regional aquifer found in the Troutdale Formation). If inappropriate well construction or system operation is the cause of the system failure, the current system may need to be modified to allow collection of the apparently small amount of water present. This may require installation of lysimeters ~~or~~ additional wells to define and monitor the sand layer. no lysimeters in lieu of wells

An evaluation of the details of well placement, sampling procedures, and analytical protocols is currently not possible because adequate groundwater samples have not been collected and the hydrology of the shallow sand layer has not been fully characterized (see Section 4.3.3). However, why not available?

some details regarding the monitoring system are provided in the CME worksheets in Attachment E. Although the general construction of the monitoring wells appears adequate, many of the details of well construction (type of sand pack, discussion of well installation procedures) are not available. Also, because water levels are insufficient to monitor, it appears that the wells have not been adequately developed.

Federal regulation 40 CFR 265.92(a) requires that a sampling and analysis plan be submitted and include procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, and chain-of-custody control. During the site inspection, a copy of PWT's sampling and analysis plan was obtained and subsequently reviewed. This three page, undated plan is inadequate because it provides almost no detail on sampling schedules, sample collection procedures, decontamination methods, analytical methods, or quality assurance/quality control (QA/QC) protocols. A copy of this plan is included in Attachment B.

4.3.3 Hydrogeological characterization--

During the installation of the groundwater monitoring system, PWT collected substantial amounts of hydrogeological information for the shallow (0-40 ft) soil layers beneath the landfill. The characterization of the shallow stratigraphy at the site is relatively complete. However, the hydrology of the site is not well defined in that a clear picture of site's recharge areas, unsaturated and saturated groundwater flow, and potential hydraulic connection of the shallow and deep permeable zones has not been developed. As previously stated, if it cannot be established that a saturated zone can be monitored in the shallow alluvial sediments, the deeper regional aquifer must be fully characterized and monitored. Based on existing information, the sand unit does not appear to represent the uppermost aquifer.

5.0 REVIEW OF ANALYTICAL DATA

Three sets of analytical data related to the RBT landfill were available for review when this report was written. First, PWT collected numerous samples from onsite lysimeters, the toe drain, and local wells from December 1983 through December 1986. Second, PWT collected one sample from Well B-5 and the toe drain in early 1988. Third, Tetra Tech collected a sample of the landfill leachate from the toe drain during the site inspection for this CME.

The first set of data is presented as part of the supporting documentation to PWT's delisting petition (Hazard Management Specialists 1987b). QA/QC information is not available for this data nor is information concerning sample collection, handling, and shipment. Concentrations of pentachlorophenol and naphthalene (when detected at all) have typically been below 2 ug/L and always below 10 ug/L. Metals concentrations have typically been below drinking water standards for chromium and arsenic.

where is this data? how often and which wells had contamination? new or old wells? new or old data?

The second set of data is from the only sampling of the new monitoring wells. In January 1988, PWT collected a sample from Well B-5 (i.e., the only well with enough water for sample collection) and one sample from the toe drain. The sample from Well B-5 had a high turbidity value (1,670 NTU) and a high coliform bacteria level (2,400 organisms/100 mL). During the site inspection on 23 May 1988, Dr. Adams indicated that the residence located east of Well B-5 had on operating septic tank/leach field. The analytical results indicate that the groundwater (or leaking surface water) affected by the septic system may be impacting the water quality around Well B-5. Results for pentachlorophenol and naphthalene show no concentration above detection limits (2 ug/L and 1 ug/L, respectively). Results of the metals analyses are not meaningful because the turbid samples were not filtered prior to analysis, resulting in deceptively high levels.

During the site inspection, Tetra Tech personnel collected several samples from the toe drain (see Section 3.0). The samples were analyzed for chlorophenols, PAHs, volatile organic compounds, and metals (see Attachment C for analytical data and Attachment D for data validation reports). The chlorophenol and PAH analyses were performed using high pressure liquid chromatography (HPLC) methods to achieve very low detection limits (i.e., below 1 ug/L in most cases). The highest chlorophenol concentration observed was 0.73 ug/L for pentachlorophenol in the sample collected from the inlet to the toe drain. PAH concentrations were typically below 1 ug/L when detected, except for naphthalene which was detected at 1.5 and 1.8 ug/L in the two toe drain samples. No volatile organic compounds were detected in any sample. Metals concentrations were below drinking water standards with the exception of iron detected in the sample collected before purging the toe drain. The high concentration of iron is expected because the water was sitting in the contact with the mild steel pipe of the toe drain for many days.

6.0 PROJECT SUMMARY AND CONCLUSIONS

As a result of the Consent Agreement and Final Order issued by U.S. EPA Region X, PWT was required to conduct several activities concerning the closure of the RBT Landfill. The purpose of this CME is to evaluate PWT's compliance with requirements of the Consent Agreement and Final Order.

The major deficiency in PWT's efforts is that they have not clearly identified the uppermost aquifer beneath the landfill. The shallow sand layer, which PWT's groundwater monitoring system is designed to monitor, will serve as an adequate aquifer for the purposes of detecting releases from the landfill only if there is enough water in it to monitor. Data presented to date do not indicate that this is the case. The hydrology of the shallow alluvial sediments and any hydraulic connection to the deeper regional aquifer must be fully characterized. If it cannot be demonstrated that representative groundwater samples can be obtained from the shallow sand layer, federal regulations [40 CFR 265.91(a)] require that another monitoring system be installed in the deeper regional aquifer.

An evaluation of the details of the monitoring system was not performed because it does not appear that the monitoring system was completed in the uppermost aquifer as required. Because the sampling and analysis plan used by PWT is inadequate, it should be revised to include the level of detail recommended in the RCRA Groundwater Monitoring Technical Enforcement Guidance Document (U.S. EPA 1986a).

7.0 REFERENCES

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ATTACHMENT A

PHOTOGRAPHIC LOG

RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

RIDGEFIELD BRICK AND TILE/PACIFIC WOOD TREATING
RIDGEFIELD, WASHINGTON

Inspection Date:	23 May 1988
Photographer:	Kurt Schmierer Tetra Tech, Inc. Bellevue, Washington

ATTACHMENT A. PHOTOGRAPHIC LOG

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1	Photo No.: 1
Date: 5/23/88	Time: 1030-1430 hours
Unit: NA	

Description: Well B-5 with old warehouse in background.

Photographer Facing: West
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1	Photo No.: 2
Date: 5/23/88	Time: 1030-1430 hours
Unit: NA	

Description: Well B-5 with old warehouse in background.

Photographer Facing: West
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1	Photo No.: 3
Date: 5/23/88	Time: 1030-1430 hours
Unit: NA	

Description: RBT landfill (panorama with photo #4).

Photographer Facing: West
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 4
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: RBT landfill (panorama with photo #3).

Photographer Facing: Northwest
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 5
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: Well B-1 in foreground and lysimeter SE in background.

Photographer Facing: South
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 6
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: Well B-6

Photographer Facing: North-northeast
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 7
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: Water level measurement at Well B-4; landfill in background.

Photographer Facing: Northeast
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 8
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: Water level measurement at Well B-7.

Photographer Facing: Northeast
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 9
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: Well B-3.

Photographer Facing: West
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1
Date: 5/23/88
Unit: NA

Photo No.: 10
Time: 1030-1430 hours

Description: Well B-2; lysimeter NW in right background.

Photographer Facing: Northwest
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1
Date: 5/23/88
Unit: NA

Photo No.: 11
Time: 1030-1430 hours

Description: RBT landfill (panorama with photo 12).

Photographer Facing: East-southeast
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1
Date: 5/23/88
Unit: NA

Photo No.: 12
Time: 1030-1430 hours

Description: RBT landfill (panorama with photo 11).

Photographer Facing: Southeast
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 13
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: RBT landfill

Photographer Facing: Southeast
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 14
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: Toe drain (note high water mark).

Photographer Facing: Down
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1 | Photo No.: 15
Date: 5/23/88 | Time: 1030-1430 hours
Unit: NA

Description: Toe drain showing drain line.

Photographer Facing: Down
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1	Photo No.: 16
Date: 5/23/88	Time: 1030-1430 hours
Unit: NA	

Description: Pumping out toe drain.

Photographer Facing: Northeast
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1	Photo No.: 17
Date: 5/23/88	Time: 1030-1430 hours
Unit: NA	

Description: Earthen impoundment collecting water pumped out of toe drain.

Photographer Facing: North
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1	Photo No.: 18
Date: 5/23/88	Time: 1030-1430 hours
Unit: NA	

Description: RBT personnel collecting samples of toe drain water.

Photographer Facing: West
Photographer Name: Kurt Schmierer

SITE NAME: Ridgefield Brick and Tile Landfill

Roll No.: 1
Date: 5/23/88
Unit: NA

Photo No.: 19
Time: 1030-1430 hours

Description: Leachate collection tank at west end of warehouse.

Photographer Facing: North
Photographer Name: Brian O'Neal

RIDGEFIELD BRICK AND TILE
CME SITE INSPECTION PHOTOGRAPHIC LOG
23 MAY 1988

Photo 1. Well B-5 with warehouse in background.

Photo 2. Well B-5 with warehouse in background.

RIDGEFIELD BRICK AND TILE
CME SITE INSPECTION PHOTOGRAPHIC LOG
23 MAY 1988

Photos 3 and 4. Ridgefield Brick and Tile landfill from eastern edge.

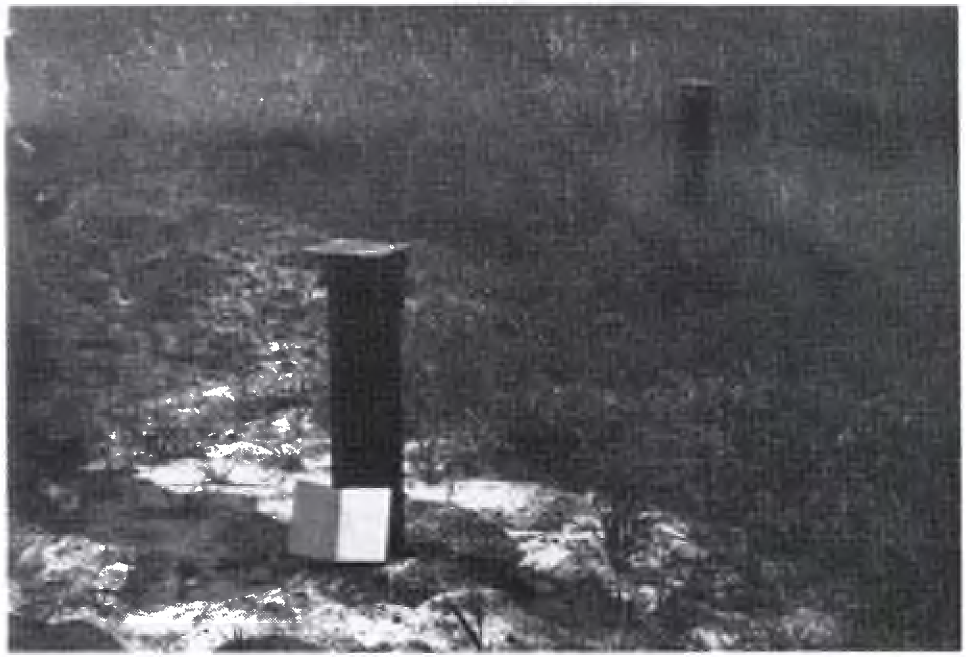


Photo 5. Well B-1 with lysimeter southeast in background.

Photo 6.
Well B-6.

Photo 7. Water level measurement at Well B-4.

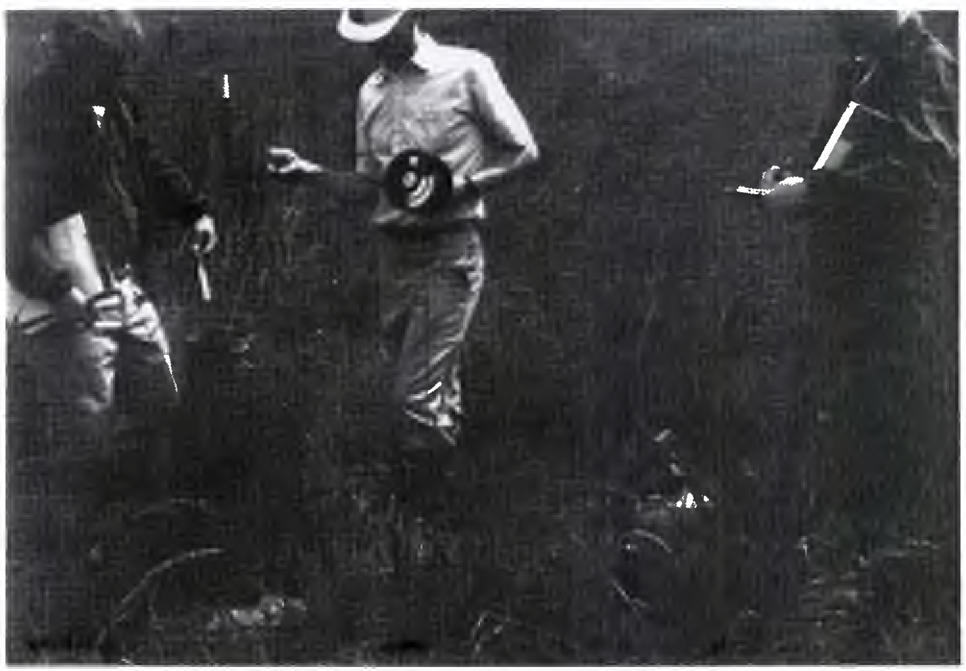
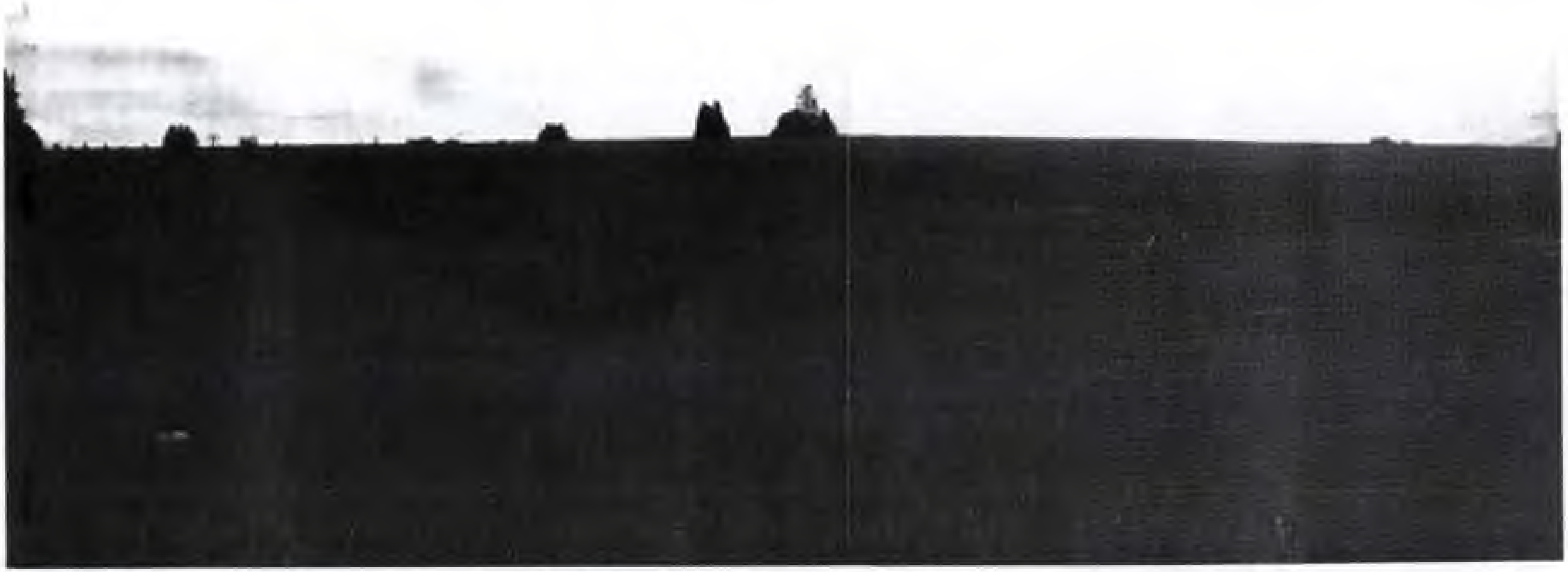


Photo 8. Water level measurement at Well B-7.

Photo 9. Water level measurement at Well B-3.

Photo 10. Water level measurement at Well B-2 with lysimeter northwest in background.



Photos 11 and 12. Ridgefield Brick and Tile landfill from northwest.

Photo 13. Ridgefield Brick and Tile landfill.

Photo 14.
Toe drain.

Photo 15. Toe drain showing drain line.

Photo 16. Pumping out toe drain.

Photo 17. Earthern impoundment collecting water from toe drain.

Photo 18. PWT personnel collecting toe drain samples.

Photo 19. Leachate collection tank.

ATTACHMENT B

RIDGEFIELD BRICK AND TILE/ PACIFIC WOOD TREATING SAMPLING AND ANALYSIS PLAN

RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

RIDGEFIELD BRICK AND TILE/PACIFIC WOOD TREATING
RIDGEFIELD, WASHINGTON

RBT WELL MONITORING AND SAMPLING PLAN

These sampling and well monitoring plans are the result of "conclusions and recommendations" in the "Progress Report - Geological and Groundwater Site Characterization", September 27, 1987, by David J. Newton Assoc., Inc., Page 13 (7.0-7.17); especially, 7.15-7.16 and Code of Federal Regulations Title 40 Parts 265 and 136.

I. The wells should be checked frequently to determine:

1. When in the season water first appears.

2. Elevation of water level in each well.

3. Duration of water level.

II. Withdrawal and recovery tests should be run.

III. 1. The wells should be sampled and analysis made by the schedule on Page 2 in the quarters when water is available.

2. The water elevation is to be measured at sampling time in each well.

3. Sampling technique is discussed on Page 3 and is to be done in accordance with 40 CFR 136.3.

SAMPLING PLAN - 2

SAMPLING FREQUENCY

PARAMETER	1ST YEAR QUARTERLY	AFTER 1ST YEAR ANNUALLY	AFTER 1ST YEAR SEMI-ANNUALLY	REF. IN 40 CFR 265.92 (b) (1)
1. ARSENIC				
2. BARIUM				
3. CADMIUM				
4. CHROMIUM				
5. FLOURIDE				
6. LEAD				
7. MERCURY				
8. NITRATE				
9. SELENIUM				
10. SILVER				
11. ENDRIN				
12. LINDANE				
13. METHOXYCHLOR				
14. TOXAPHENE				
15. 2, 4, D				
16. 2, 4, 5 T, P SILVEX				
17. RADIUM				
18. GROSS ALPHA				
19. GROSS BETA				
20. TURBIDITY				
21. COLIFORM				
22. CHLORIDE		+		265.92 (b) (2)
23. IRON		+		
24. MANGANESE		+		
25. PHENOLS		+		
26. SODIUM		+		
27. SULFATE		+		
28. pH			+	265.92 (b) (3)
29. Sp. CONDUCTANCE			+	
30. TOTAL ORG. CARBON			+	
31. TOTAL ORG. HOLOGENS			+	

SAMPLING PLAN - 3

SAMPLING TECHNIQUE

Sampling should be done by persons with training in quantitative and micro-analysis or with training as to the required preparations for these specific constituents.

The bottle used must either be specifically washed, as required for the given analysis, or prepared by the laboratory who is to run the analysis.

The sample preparations are to be as follows:

PARAMETER	PREPARATION REQUIRED		MAXIMUM HOLDING TIME
METALS 1-10,23 24,26	1) Filter 2)	pH<2c̄ HNO_3	6 MONTHS
RADIOACTIVITY	-	pH<2c̄ HNO3	6 MONTHS
PESTICIDES 11-16	4° C		7 DAYS
TURFIDITY	4° C		2 DAYS
COLIFORM	4° C		6 HOURS
SULFATE	4° C		28 DAYS
PHENOL	4° C		7 DAYS
TOX	4° C		
TOC	4° C		
SPECIFIC CONDUCTANCE	4° C		28 DAYS
CHLORIDE	NONE		28 DAYS
FLUORIDE	NONE		28 DAYS
pH	NONE		ANALYZE IMMEDIATELY
NITRATE (as N)	4° C		48 HOURS

Notwithstanding the above listed holding times, the samples should be sent as soon as possible for analysis. Note the coliform time requirement.

CHAIN OF CUSTODY

A chain of custody letter is to be signed by the sampler, by each person to transport the samples, and by the receiving laboratory certifying the integrity of the samples.

(See attached Chain of Custody letter or form.)

ATTACHMENT C

ANALYTICAL DATA

RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

RIDGEFIELD BRICK AND TILE/PACIFIC WOOD TREATING
RIDGEFIELD, WASHINGTON

Project: HWD-084B RIDGEFIELD BRICK & TILE Officer: MLB Account: AGDD3A

Sample No: 88 223010 Begin Sample Date: 88/05/23 12:30 Source: Landfill Surface Run Depth: QA Code:

Laboratory: RX Description: TD-01

Poly Arom Hydrocrbn	Water-Total Result	Units
Benzo(a)pyrene	50U	ng/l
Dibenzo(a,h)anthracene	200U	ng/l
Benzo(a)anthracene	50U	ng/l
Acenaphthene	5700U	ng/l
Phenanthrene	400	ng/l
Fluorene	800	ng/l
Naphthalene	1500	ng/l
Anthracene	40	ng/l
Pyrene	300UB	ng/l
Benzo(ghi)perylene	200U	ng/l
Indeno(1,2,3-cd)pyrene	90U	ng/l
Benzo(b)fluoranthene	30U	ng/l
Fluoranthene	100	ng/l
Benzo(k)fluoranthene	10U	ng/l
Acenaphthylene	5700U	ng/l
Chrysene	50U	ng/l

Chlorophenols (GC)	Water-Total Result	Units
Pentachlorophenol	0.14	ug/l
2,4,6-Trichlorophenol	0.002U	ug/l
2,4,5-Trichlorophenol	0.002U	ug/l
2,3,4,5-Tetrachlorophen	0.054	ug/l
Spike Dinoseb	47	% Recov

(Sample Complete)

Project: HWD-084B   RIDGEFIELD BRICK & TILE   Officer: MLB   Account: AGDD3A

Sample No: 88 223011   Begin Sample Date: 88/05/23 12:37   Source: Landfill Surface Run   Depth: QA Code:

Laboratory: RX   Description: TD-02

Poly Arom Hydrocrbn	Water-Total Result	Units
Benzo(a)pyrene	70U	ng/l
Dibenzo(a,h)anthracene	300U	ng/l
Benzo(a)anthracene	70U	ng/l
Acenaphthene	9000U	ng/l
Phenanthrene	500	ng/l
Fluorene	900	ng/l
Naphthalene	1800	ng/l
Anthracene	40	ng/l
Pyrene	400UB	ng/l
Benzo(ghi)perylene	300U	ng/l
Indeno(1,2,3-cd)pyrene	100U	ng/l
Benzo(b)fluoranthene	40U	ng/l
Fluoranthene	100J	ng/l
Benzo(k)fluoranthene	10U	ng/l
Acenaphthylene	9000U	ng/l
Chrysene	70U	ng/l

Poly Arom Hydrocrbn Matrix Spike #1	Water-Total Result	Units
Benzo(a)pyrene	76	% Recov
Dibenzo(a,h)anthracene	32	% Recov
Benzo(a)anthracene	86	% Recov
Acenaphthene	72	% Recov
Phenanthrene	67	% Recov
Fluorene	58	% Recov
Naphthalene	48	% Recov
Anthracene	52	% Recov
Pyrene	80	% Recov
Benzo(ghi)perylene	66	% Recov
Indeno(1,2,3-cd)pyrene	86	% Recov
Benzo(b)fluoranthene	88	% Recov
Fluoranthene	89	% Recov
Benzo(k)fluoranthene	72	% Recov
Acenaphthylene	70	% Recov
Chrysene	80	% Recov

Poly Arom Hydrocrbn Matrix Spike #2	Water-Total Result	Units
Benzo(a)pyrene	78	% Recov
Dibenzo(a,h)anthracene	28	% Recov
Benzo(a)anthracene	86	% Recov

Poly Arom Hydrocrbn *** Continued *** Matrix Spike #2	Water-Total Result	Units
Acenaphthene	UND	% Recov
Phenanthrene	34	% Recov
Fluorene	21	% Recov
Naphthalene	UND	% Recov
Anthracene	42	% Recov
Pyrene	70	% Recov
Benzo(ghi)perylene	60	% Recov
Indeno(1,2,3-cd)pyrene	86	% Recov
Benzo(b)fluoranthene	90	% Recov
Fluoranthene	73	% Recov
Benzo(k)fluoranthene	72	% Recov
Acenaphthylene	UND	% Recov
Chrysene	80	% Recov

Chlorophenols (GC)	Water-Total Result	Units
Pentachlorophenol	0.73	ug/l
2,4,6-Trichlorophenol	0.003U	ug/l
2,4,5-Trichlorophenol	0.072M	ug/l
2,3,4,5-Tetrachlorophen	0.37	ug/l
Spike Dinoseb	79	% Recov

Chlorophenols (GC) Matrix Spike #1	Water-Total Result	Units
Pentachlorophenol	0.051	ug/l
2,4,6-Trichlorophenol	0.018U	ug/l
2,4,5-Trichlorophenol	0.018U	ug/l
2,3,4,5-Tetrachlorophen	0.030	ug/l
Spike Dinoseb	41	% Recov

Chlorophenols (GC) Matrix Spike #2	Water-Total Result	Units
Pentachlorophenol	0.081	ug/l
2,4,6-Trichlorophenol	0.018U	ug/l
2,4,5-Trichlorophenol	0.018U	ug/l
2,3,4,5-Tetrachlorophen	0.018U	ug/l
Spike Dinoseb	44	% Recov

(Sample Complete)

Project: HWD-084B RIDGEFIELD BRICK & TILE Officer: MLB Account: AGDD3A

Sample No: 88 223012 Begin Sample Date: 88/05/23 12:48 Source: Landfill Surface Run Depth: QA Code:

Laboratory: RX Description: TD-03

Poly Arom Hydrocrbn	Water-Total Result	Units
Benzo(a)pyrene	50U	ng/l
Dibenzo(a,h)anthracene	200U	ng/l
Benzo(a)anthracene	50U	ng/l
Acenaphthene	5700U	ng/l
Phenanthrene	400	ng/l
Fluorene	500	ng/l
Naphthalene	3300U	ng/l
Anthracene	40	ng/l
Pyrene	300UB	ng/l
Benzo(ghi)perylene	200U	ng/l
Indeno(1,2,3-cd)pyrene	100U	ng/l
Benzo(b)fluoranthene	30U	ng/l
Fluoranthene	100	ng/l
Benzo(k)fluoranthene	10U	ng/l
Acenaphthylene	5700U	ng/l
Chrysene	50U	ng/l

Chlorophenols (GC)	Water-Total Result	Units
Pentachlorophenol	0.082	ug/l
2,4,6-Trichlorophenol	0.002U	ug/l
2,4,5-Trichlorophenol	0.002U	ug/l
2,3,4,5-Tetrachlorophen	0.022	ug/l
Spike Dinoseb	99	% Recov

(Sample Complete)

Project: HWD-084B RIDGEFIELD BRICK & TILE Officer: MLB Account: AGDD3A

Sample No: 88 223013 Begin Sample Date: 88/05/23 13:23 Source: Landfill Surface Run Depth: QA Code:

Laboratory: RX Description: TD-04

Poly Arom Hydrocrbn	Water-Total Result	Units
Benzo(a)pyrene	50U	ng/l
Dibenzo(a,h)anthracene	200U	ng/l
Benzo(a)anthracene	50U	ng/l
Acenaphthene	6000U	ng/l
Phenanthrene	200	ng/l
Fluorene	700U	ng/l
Naphthalene	3500U	ng/l
Anthracene	20	ng/l
Pyrene	300UB	ng/l
Benzo(ghi)perylene	200U	ng/l
Indeno(1,2,3-cd)pyrene	100U	ng/l
Benzo(b)fluoranthene	30U	ng/l
Fluoranthene	100U	ng/l
Benzo(k)fluoranthene	10U	ng/l
Acenaphthylene	6000U	ng/l
Chrysene	50U	ng/l

Chlorophenols (GC)	Water-Total Result	Units
Pentachlorophenol	0.22	ug/l
2,4,6-Trichlorophenol	0.002U	ug/l
2,4,5-Trichlorophenol	0.002U	ug/l
2,3,4,5-Tetrachlorophen	0.029	ug/l
Spike Dinoseb	79	% Recov

(Sample Complete)

Project: HWD-084B

RIDGEFIELD BRICK & TILE

Officer: MLB Account: AGDD3A

Sample No: 88 223014 Begin Sample Date: 88/05/23 14:03 Source: Landfill Surface Run Depth: QA Code:

Laboratory: RX Description: TD-05

Poly Arom Hydrocrbn	Water-Total Result	Units
Benzo(a)pyrene	50U	ng/l
Dibenzo(a,h)anthracene	200U	ng/l
Benzo(a)anthracene	50U	ng/l
Acenaphthene	6600U	ng/l
Phenanthrene	50U	ng/l
Fluorene	800U	ng/l
Naphthalene	3800U	ng/l
Anthracene	10U	ng/l
Pyrene	300UB	ng/l
Benzo(ghi)perylene	200U	ng/l
Indeno(1,2,3-cd)pyrene	100U	ng/l
Benzo(b)fluoranthene	30U	ng/l
Fluoranthene	100U	ng/l
Benzo(k)fluoranthene	10U	ng/l
Acenaphthylene	6600U	ng/l
Chrysene	50U	ng/l

Chlorophenols (GC)	Water-Total Result	Units
Pentachlorophenol	0.0034	ug/l
2,4,6-Trichlorophenol	0.002U	ug/l
2,4,5-Trichlorophenol	0.002U	ug/l
2,3,4,5-Tetrachlorophen	0.002U	ug/l
Spike Dinoseb	51	% Recov

(Sample Complete)

Project: HWD-084B

RIDGEFIELD BRICK & TILE

Officer: MLB Account: AGDD3A

Blank ID: BN8148W

Poly Arom Hydrocrbn Blank #1	Water-Total Result	Units
Benzo(a)pyrene	300U	ng/l
Dibenzo(a,h)anthracene	1000U	ng/l
Benzo(a)anthracene	300U	ng/l
Acenaphthene	27,000U	ng/l
Phenanthrene	300U	ng/l
Fluorene	3200U	ng/l
Naphthalene	16,000U	ng/l
Anthracene	50U	ng/l
Pyrene	NAI	ng/l
Benzo(ghi)perylene	1000U	ng/l
Indeno(1,2,3-cd)pyrene	500U	ng/l
Benzo(b)fluoranthene	100U	ng/l
Fluoranthene	500U	ng/l
Benzo(k)fluoranthene	50U	ng/l
Acenaphthylene	27,000U	ng/l
Chrysene	300U	ng/l

Chlorophenols (GC) Blank #1	Water-Total Result	Units
Pentachlorophenol	UND	ug/l
2,4,6-Trichlorophenol	UND	ug/l
2,4,5-Trichlorophenol	UND	ug/l
2,3,4,5-Tetrachlorophen	UND	ug/l
Spike Dinoseb	59	% Recov

(Sample Complete)

Project: HWD-084B

RIDGEFIELD BRICK & TILE

Officer: MLB Account: AGDD3A

Blank ID: BN8148WJ

Poly Arom Hydrocrbn Blank #2	Water-Total Result	Units
Benzo(a)pyrene	200U	ng/l
Dibenzo(a,h)anthracene	900U	ng/l
Benzo(a)anthracene	200U	ng/l
Acenaphthene	26,000U	ng/l
Phenanthrene	200U	ng/l
Fluorene	3000U	ng/l
Naphthalene	15,000U	ng/l
Anthracene	40U	ng/l
Pyrene	NIA	ng/l
Benzo(ghi)perylene	900U	ng/l
Indeno(1,2,3-cd)pyrene	400U	ng/l
Benzo(b)fluoranthene	100U	ng/l
Fluoranthene	400U	ng/l
Benzo(k)fluoranthene	40U	ng/l
Acenaphthylene	26,000U	ng/l
Chrysene	200U	ng/l

(Sample Complete)

Project: HWD-084B

RIDGEFIELD BRICK & TILE

Officer: MLB Account: AGDD3A

Blank ID: BN8149WJ

Chlorophenols (GC) Blank #2	Water-Total Result	Units
Pentachlorophenol	UND	ug/l
2,4,6-Trichlorophenol	UND	ug/l
2,4,5-Trichlorophenol	UND	ug/l
2,3,4,5-Tetrachlorophen	UND	ug/l
Spike Dinoseb	77	% Recov

(Sample Complete)

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JC809

Lab Name: Laucks Testing Labs Contract: 68-01-7406

Lab Code: LAUCKS Case No.:9688 SAS No. ______ SDG No.:JC809

Matrix: (soil/water)WATER Lab Sample ID: 10034-01

Sample wt/vol: 5.0 (g/ml)ML Lab File ID: 10034V01

Level: (low/med) LOW Date Received: 05/25/88

% Moisture: not dec.__ Date Analyzed: 05/31/88

Column: (pack/cap) CAP Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JC810

Lab Name: Laucks Testing Labs   Contract: 68-01-7406

Lab Code: LAUCKS   Case No.:9688   SAS No. ______   SDG No.:JC809

Matrix: (soil/water)WATER   Lab Sample ID: 10034-02

Sample wt/vol: 5.0 (g/ml)ML   Lab File ID: 10034V02

Level: (low/med) LOW   Date Received: 05/25/88

% Moisture: not dec.__   Date Analyzed: 05/31/88

Column: (pack/cap) CAP   Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	4	J
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	1	J
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JC814

Lab Name: Laucks Testing Labs   Contract: 68-01-7406

Lab Code: LAUCKS   Case No.:9688   SAS No. ______   SDG No.:JC809

Matrix: (soil/water)WATER   Lab Sample ID: 10034-03

Sample wt/vol: 5.0 (g/ml)ML   Lab File ID: 10034V03

Level: (low/med) LOW   Date Received: 05/25/88

% Moisture: not dec.__   Date Analyzed: 05/31/88

Column: (pack/cap) CAP   Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	8	J
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U

FORM I

U.S. EPA Contract Laboratory Program
Sample Management Office
P,O, Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.

MJB367

968810 06

Date 06/13/88

INORGANIC ANALYSIS DATA SHEET

LAB NAME ASSOCIATED LABORATORIES

CASE NO. 9688

SOW NO. 785

Lab Receipt Date 05/25/88

LAB SAMPLE ID. NO. F49090-1

QC REPORT NO. 79

Elements Identified and Measured

Concentration: Low X Medium ____

Matrix: Water X Soil ____ Sludge ____ Other ____

ug/L

1.	Aluminum	61U	P	13.	Magnesium	12400	P
2.	Antimony	23U	P	14.	Manganese	4760	P
3.	Arsenic	3.4U	F	15.	Mercury	0.20 U	CV
4.	Barium	[58]	P	16.	Nickel	13U	P
5.	Beryllium	3.9U	P	17.	Potassium	[1400]	P
6.	Cadmium	4.0U	P	18.	Selenium	6.0U (N)	F
7.	Calcium	28400	P	19.	Silver	6.4U	P
8.	Chromium	7.9U	P	20.	Sodium	20000	P
9.	Cobalt	[9.5]	P	21.	Thallium	.70U (N)	F
10.	Copper	25U	P	22.	Vanadium	8.8U	P
11.	Iron	76600	P	23.	Zinc	[19]	P
12.	Lead	12U (N)	F		Percent Solids (%)		

Cyanide NR

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

CLEAR WATER

Lab Manager Ed Behare

[illegible]

FORM I

U.S. EPA Contract Laboratory Program
Sample Management Office
P,O, Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.
MJB370

968810 06

Date 06/13/88

INORGANIC ANALYSIS DATA SHEET

LAB NAME ASSOCIATED LABORATORIES

CASE NO. 9688

SOW NO. 785

Lab Receipt Date 05/25/88

LAB SAMPLE ID. NO. F49090-2

QC REPORT NO. 79

Elements Identified and Measured

Concentration: Low X Medium

Matrix: Water X Soil Sludge Other

ug/L

1.	Aluminum	61U	P	13.	Magnesium	10200	P
2.	Antimony	23U	P	14.	Manganese	3270	P
3.	Arsenic	[6.0]	F	15.	Mercury	0.30	CV
4.	Barium	[61]	P	16.	Nickel	[24]	P
5.	Beryllium	3.9U	P	17.	Potassium	[1140]	P
6.	Cadmium	4.0U	P	18.	Selenium	6.0U (N)	F
7.	Calcium	24300	P	19.	Silver	6.4U	P
8.	Chromium	24	P	20.	Sodium	17800	P
9.	Cobalt	[13]	P	21.	Thallium	.70U (N)	F
10.	Copper	25U	P	22.	Vanadium	8.8U	P
11.	Iron	7430	P	23.	Zinc	33	P
12.	Lead	6.1 (N), S	F		Percent Solids (%)		
	Cyanide	NR					

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

CLEAR WATER

Lab Manager Ed Behare
by Tme

FORM I

U.S. EPA Contract Laboratory Program
Sample Management Office
P,O, Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.

MJB371

968810 06

Date 06/13/88

INORGANIC ANALYSIS DATA SHEET

LAB NAME ASSOCIATED LABORATORIES

CASE NO. 9688

SOW NO. 785

Lab Receipt Date 05/25/88

LAB SAMPLE ID. NO. F49090-3

QC REPORT NO. 79

Elements Identified and Measured

Concentration: Low X Medium ______

Matrix: Water X Soil ______ Sludge ______ Other ______

ug/L

1.	Aluminum	61U	P	13.	Magnesium	[49]	P
2.	Antimony	23U	P	14.	Manganese	7.8U	P
3.	Arsenic	3.4U	F	15.	Mercury	0.20 U	CV
4.	Barium	2.3U	P	16.	Nickel	13U	P
5.	Beryllium	3.9U	P	17.	Potassium	528U	P
6.	Cadmium	4.0U	P	18.	Selenium	.60U (N)	F
7.	Calcium	[152]	P	19.	Silver	6.4U	P
8.	Chromium	7.9U	P	20.	Sodium	[315]	P
9.	Cobalt	8.9U	P	21.	Thallium	.70U (N)	F
10.	Copper	25U	P	22.	Vanadium	8.8U	P
11.	Iron	[88]	P	23.	Zinc	8.7U	P
12.	Lead	5.2 (N)	F		Percent Solids (%)		
	Cyanide	NR					

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

CLEAR WATER

Lab Manager Ed Bc[illegible]

ATTACHMENT D

DATA VALIDATION REPORTS
FOR U.S. EPA VOLATILE AND INORGANIC DATA

RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

RIDGEFIELD BRICK AND TILE/PACIFIC WOOD TREATING
RIDGEFIELD, WASHINGTON

DATA VALIDATION FOR
VOLATILE ORGANIC ANALYSES:
U.S. EPA CASE NO. 9688
RIDGEFIELD BRICK AND TILE

This report presents the results of the quality assurance review of three water samples collected from the Ridgefield Brick and Tile landfill in Ridgefield, WA on 27 May 1988. The samples were numbered as follows:

U.S. EPA Sample No.	Matrix	Analysis Performed
JC809	Water	VOA
JC810	Water	VOA
JC814	Water	VOA
JC810MS	Water	VOA
JC810MSD	Water	VOA

Of the three water samples analyzed, one (JC810) was analyzed as a matrix spike/matrix spike duplicate (MS/MSD) for the volatile organic (VOA) fraction.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the QC specifications outlined in IFB WA87-K236, IFB WA87-K237, and IFB WA87-K238 (U.S. EPA 1987). The usefulness of the data is based on the criteria presented in U.S. EPA (1988).

Definitions of qualifiers assigned to the sample results based on QC criteria are attached as Table 1. Sample results with assigned data qualifiers are also included as an attachment.

1. HOLDING TIMES

Sample No.	Date Collected	Date Analyzed	Holding Time (Days)
JC809	5/23/88	5/31/88	9
JC810[1]	5/23/88	5/31/88	9
JC814	5/23/88	5/31/88	9
JC810MS	5/23/88	5/31/88	9
JC810MSD	5/23/88	5/31/88	9

The samples were preserved in the field with HNO_3. The sample holding times were within the QC limits for acid-preserved samples in U.S. EPA Contract Laboratory Program (CLP) protocols (U.S. EPA 1987).

2. GC/MS TUNING

All gas chromatography/mass spectrometry (GC/MS) tuning results were within QC criteria for volatile organic analyses.

3. CALIBRATION

Initial Calibration

Initial calibration results for the volatile organic analyses were acceptable and within QC limits.

Continuing Calibration

The relative response factor (RRF) for all continuing calibrations were within QC criteria. However, several compounds exceeded the QC criteria of less than 25 percent difference (%D) between initial and continuing calibration RRF:

---

[1] Samples JC810, JC811, and JC812 were collected at the same station and were combined at the analytical laboratory to allow for the analysis of the matrix spike (JC8910MS) and the matrix spike duplicate (JC810MSD) for sample JC810.

Compound	%D	QC Criteria
Chloromethane	26.2	<25 %D
Bromomethane	-34.0	<25 %D
Methylene chloride	-52.3	<25 %D
Bromodichloromethane	-38.2	<25 %D
Cis-1, 3-dichloropropene	-76.7	<25 %D
4-Methyl-2-pentanone	31.0	<25 %D
2-Hexanone	35.0	<25 %D
1,2-Dichloroethane-d_4	28.5	<25 %D

None of these compounds were found in the samples. Detection limits reported for these compounds were qualified as estimated and assigned the qualifier J.

4. BLANKS

Positive sample results were not reported for any volatile organic compound in the method blank that was associated wit the samples.

5. SURROGATE RECOVERY

All reported surrogate recoveries were acceptable for the volatile organic analyses. The recoveries of all three volatile surrogate compounds (d_8-toluene, bromofluorobenzene, and d_4-1,2-dichloroethane) were within CLP-specified QC limits.

6. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Matrix spike/matrix spike duplicate (MS/MSD) results were acceptable. One sample (JC810) was analyzed as MS/MSD for volatile organic compounds. Recoveries for the spike compounds were within QC criteria. In addition, the relative percent difference (RPD) between the values for the MS and MSD samples was within the QC limits.

7. FIELD DUPLICATES

Two field duplicates (JC811 and JC812) were collected for sample JC810. In order to analyze the MS/MSD for sample JC810, the two field duplicate samples were composited with sample JC810 after submittal to the laboratory. Thus, there are no field duplicate results to evaluate for this case.

8. INTERNAL STANDARDS PERFORMANCE

The volatile organic internal standards performance was acceptable. All volatile internal standards were within the QC limits.

9. TCL COMPOUND IDENTIFICATION

Generally, the identification of target compound list (TCL) compounds in the volatile organic analyses was acceptable. However, false negatives were reported for acetone in sample JC809, as well as for methylene chloride and xylenes in sample JC814. Therefore, the detection limits reported for these compounds in the respective samples were qualified as unusable and assigned an R.

10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS

The reported quantitation results and Contract Required Quantitation Limits (CRQLs) were calculated accurately.

11. TENTATIVELY IDENTIFIED COMPOUNDS

There were no tentatively identified compounds (TICs) found in the samples analyzed.

12. SYSTEM PERFORMANCE

The analytical system performance was acceptable. No signs of unusual instrument performance were observed.

13. OVERALL ASSESSMENT OF DATA

The data are acceptable for use except where assigned a data qualifier. The data qualifiers modify the usefulness of the individual values.

14. REFERENCES

U.S. Environmental Protection Agency. 1987. U.S. EPA contract laboratory program statement of work for organics analysis, multi-media multi-concentration. IFB WA-87K236, K237, and K238. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency. 1988. Laboratory data validation functional guidelines for evaluating organics analyses. Prepared by the U.S. EPA Data Review Work Group for the U.S. EPA, Hazardous Site Evaluation Division, Washington, DC.

TABLE 1. DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
J	The associated numerical value is an estimated quantity.
N	Presumptive evidence of the presence of the material exists.
UJ	The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
R	The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.
B	Compound was found in the method blank.

COPY

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JC809

Lab Name: Laucks Testing Labs   Contract: 68-01-7406

Lab Code: LAUCKS   Case No.:9688   SAS No. ______   SDG No.:JC809

Matrix: (soil/water)WATER   Lab Sample ID: 10034-01

Sample wt/vol: 5.0 (g/ml)ML   Lab File ID: 10034V01

Level: (low/med) LOW   Date Received: 05/25/88

% Moisture: not dec.__   Date Analyzed: 05/31/88

Column: (pack/cap) CAP   Dilution Factor: 1

CONCENTRATION UNITS: (ug/L or ug/Kg)UG/L

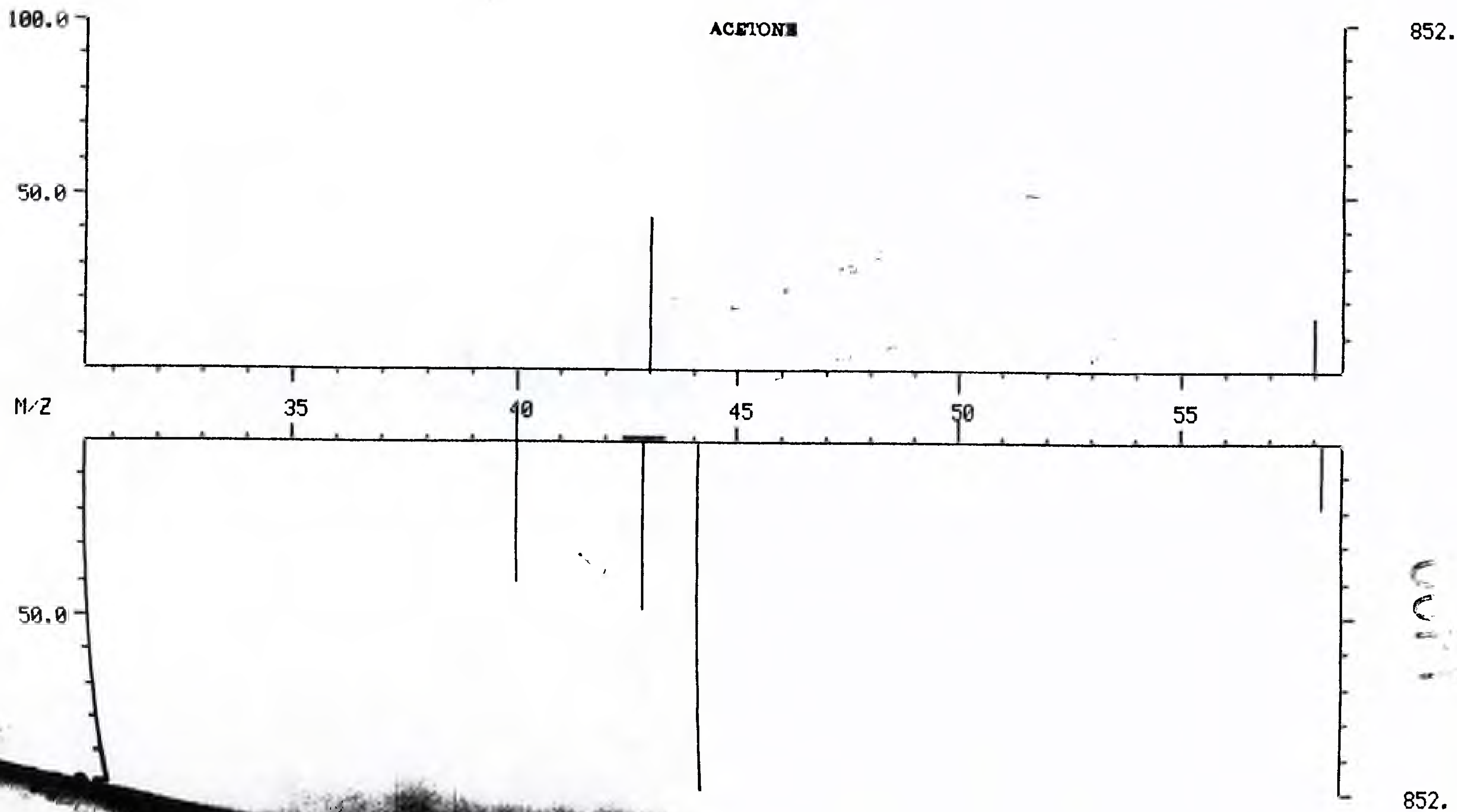
CAS NO.	COMPOUND	(ug/L or ug/Kg)UG/L	Q
74-87-3	Chloromethane	10	UJ
74-83-9	Bromomethane	10	UJ
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	UJ
67-64-1	Acetone	10	UR
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	UJ
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	UJ
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	UJ
591-78-6	2-Hexanone	10	UJ
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U

028

DUAL MASS SPECTRUM
05/31/88 12:59:00 + 3:46
SAMPLE: JC809 10034-1 5ML+IS/SS CASE#9688
CONDS.: INSTRUMENT: 1020J **LAUCKS TESTING LABS**
ENHANCED (S 15B 2N 0T)

DATA: 10034V01 #151
CALI: CA053188A #4

BASE M/Z: 43/ 44
RIC: 501./ 1765.



1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JC810

Lab Name: Laucks Testing Labs Contract: 68-01-7406

Lab Code: LAUCKS Case No.:9688 SAS No. ______ SDG No.:JC809

Matrix: (soil/water)WATER Lab Sample ID: 10034-02

Sample wt/vol: 5.0 (g/ml)ML Lab File ID: 10034V02

Level: (low/med) LOW Date Received: 05/25/88

% Moisture: not dec.__ Date Analyzed: 05/31/88

Column: (pack/cap) CAP Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)UG/L	Q
74-87-3	Chloromethane	10	UJ
74-83-9	Bromomethane	10	UJ
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	UJ
67-64-1	Acetone	4	J
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	1	J
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	UJ
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	UJ
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	UJ
591-78-6	2-Hexanone	10	UJ
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

JC814

b Name: Laucks Testing Labs Contract: 68-01-7406

ab Code: LAUCKS Case No.: 9688 SAS No. ______ SDG No.: JC809

atrix: (soil/water) WATER Lab Sample ID: 10034-03

ample wt/vol: 5.0 (g/ml) ML Lab File ID: 10034V03

evel: (low/med) LOW Date Received: 05/25/88

Moisture: not dec. __ Date Analyzed: 05/31/88

olumn: (pack/cap) CAP Dilution Factor: 1

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	UJ
74-83-9	Bromomethane	10	UJ
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	UJR
67-64-1	Acetone	10	U
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	8	J
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	UJ
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	UJ
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	UJ
591-78-6	2-Hexanone	10	UJ
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Xylene (total)	5	UR

1/87 Rev.

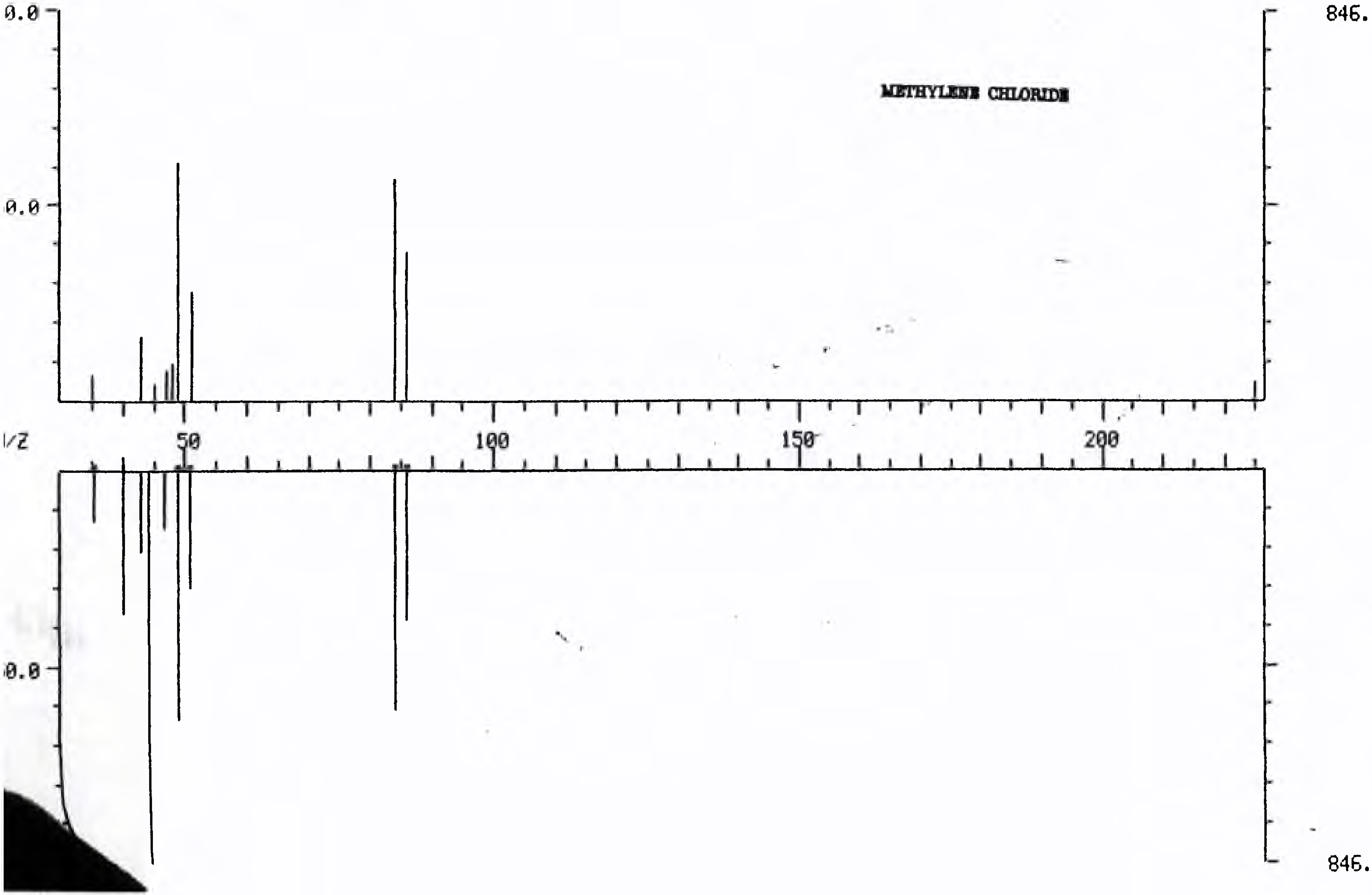
FORM I VOA

048

DUAL MASS SPECTRUM
05/31/88 14:14:00 + 4:22
SAMPLE: JC814 10034-03 5ML+IS/SS CASE#9688
CONDS.: INSTRUMENT: 1020J **LAUCKS TESTING LABS**
ENHANCED (S 15B 2N 0T)

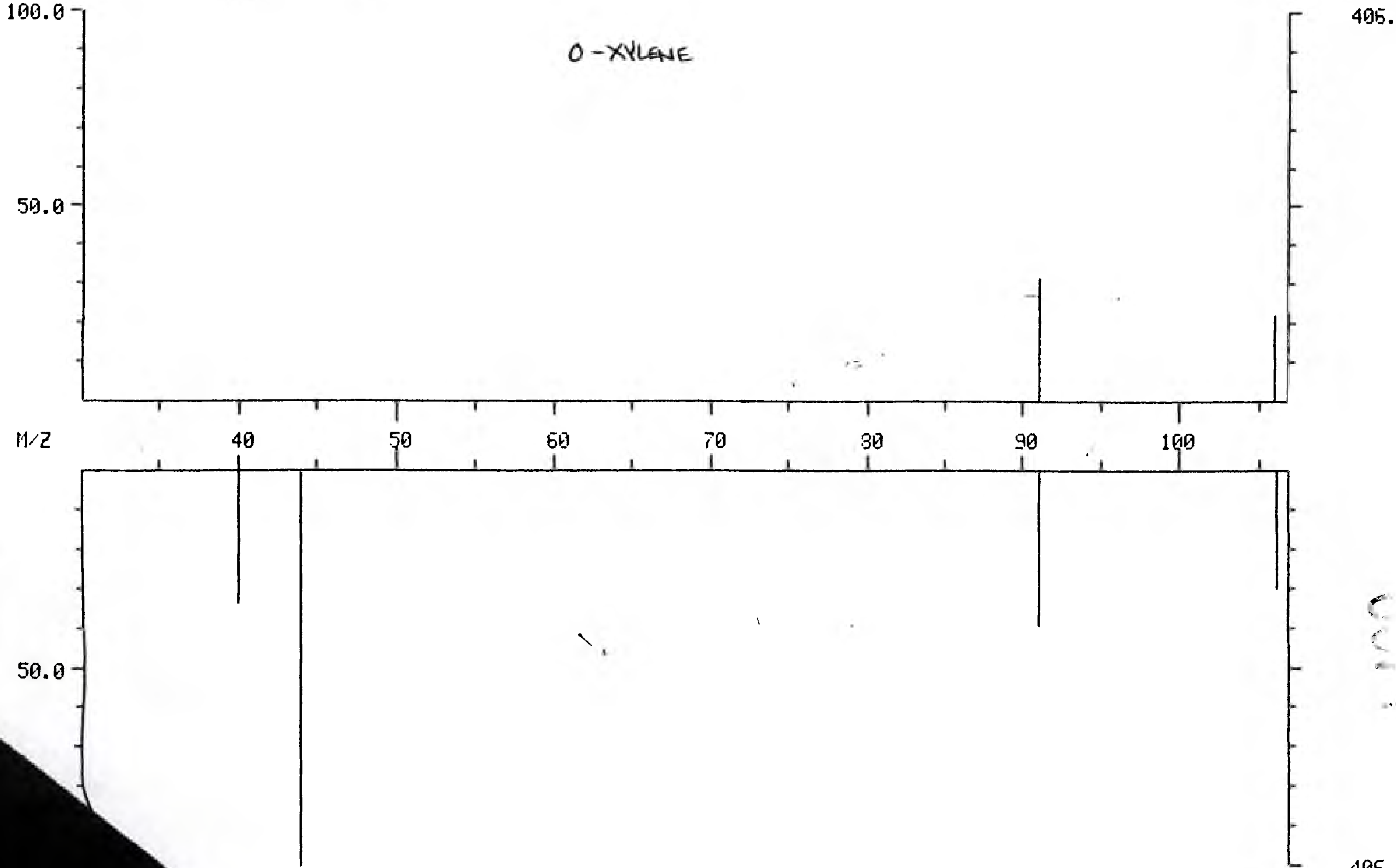
DATA: 10034V03 #175
CALI: CA053188A #4

BASE M/Z: 49/ 44
RIC: 1971./ 3199.



DUAL MASS SPECTRUM
05/31/88 14:14:00 + 15:25
SAMPLE: JC814 10034-03 5ML+IS/SS CASE#9688
CONDS.: INSTRUMENT: 1020J **LAUCKS TESTING LABS**
ENHANCED (S 15B 2N 0T)

DATA: 10034V03 #617 BASE M/Z: 91/ 44
CALI: CA053188A #4 RIC: 216./ 826.

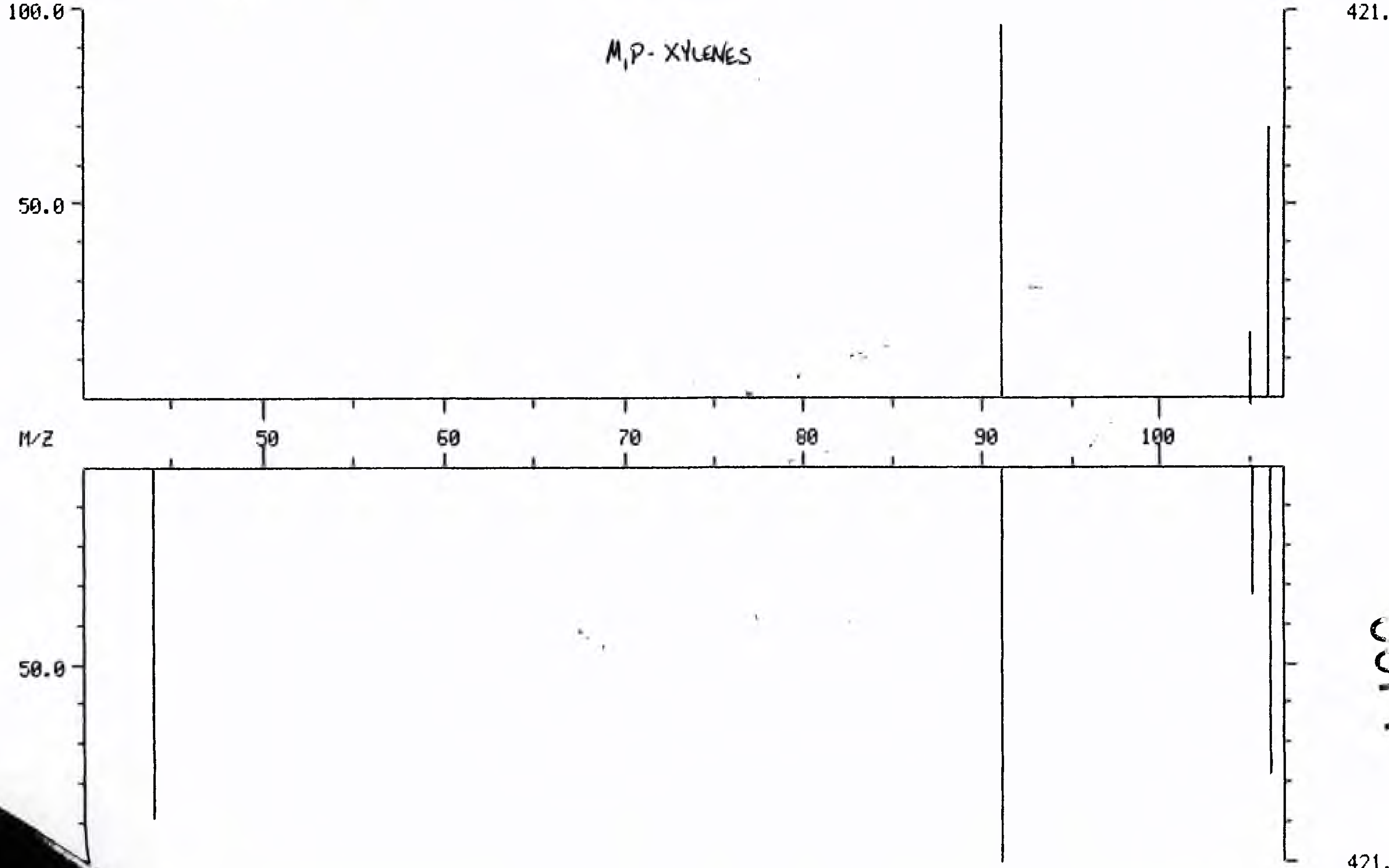


050

DUAL MASS SPECTRUM
05/31/88 14:14:00 + 14:37
SAMPLE: JC814 10034-03 5ML+IS/SS CASE#9688
CONDS.: INSTRUMENT: 1020J **LAUCKS TESTING LABS**
ENHANCED (S 15B 2N 0T)

DATA: 10034V03 #585
CALI: CA053188A #4

BASE M/Z: 91/ 91
RIC: 765./ 1263.



7A
VOLATILE CONTINUING CALIBRATION CHECK

ame: Laucks Testing Labs Contract: 68-01-7406

b Code: LAUCKS Case No.:9688 SAS No. _______ SDG No.:JC809

strument ID: 1020J Calibration Date:05/31/88 Time:11:35

b File ID: 0531V2J1 Init. Calib. Date(s): 05/03/88 05/03/88

trix:(soil/water) WATER Level:(low/med) LOW Column:(pack/cap) CAP

n RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND	RRF	RRF50	%D	
Chloromethane	#1.067	0.787	26.2	#
Bromomethane	1.146	1.536	-34.0	
Vinyl Chloride	*1.050	0.987	6.0	*
Chloroethane	0.812	0.846	-4.2	
Methylene Chloride	1.199	1.827	-52.3	
Acetone	0.275	0.266	3.5	
Carbon Disulfide	2.952	2.380	19.4	
1,1-Dichloroethene	*0.992	1.100	-10.9	*
1,1-Dichloroethane	#1.940	1.763	9.1	#
1,2-Dichloroethene (total)	1.124	1.279	-13.8	
Chloroform	*2.251	1.939	13.8	*
1,2-Dichloroethane	1.654	1.463	11.5	
2-Butanone	0.113	0.102	9.7	
1,1,1-Trichloroethane	1.447	1.409	2.6	
Carbon Tetrachloride	1.342	1.144	14.8	
Vinyl Acetate	2.053	1.954	4.8	
Bromodichloromethane	0.500	0.691	-38.2	
1,2-Dichloropropane	*0.343	0.362	-5.7	*
cis-1,3-Dichloropropene	0.364	0.643	-76.7	
Trichloroethene	0.297	0.327	-10.0	
Dibromochloromethane	0.448	0.444	0.9	
1,1,2-Trichloroethane	0.310	0.296	4.6	
Benzene	0.827	0.950	-14.8	
trans-1,3-Dichloropropene	0.336	0.255	23.9	
Bromoform	#0.271	0.299	-10.3	#
4-Methyl-2-Pentanone	0.299	0.206	31.0	
2-Hexanone	0.197	0.128	35.0	
Tetrachloroethene	0.253	0.259	-2.2	
1,1,2,2-Tetrachloroethane	#0.527	0.548	-3.9	#
Toluene	*0.559	0.556	0.5	*
Chlorobenzene	#0.723	0.725	-0.2	#
Ethylbenzene	*0.331	0.369	-11.4	*
Styrene	0.740	0.874	-18.2	
Xylene (total)	0.407	0.476	-17.0	
Toluene-d8	1.067	0.931	12.8	
Bromofluorobenzene	0.699	0.691	1.1	
1,2-Dichloroethane-d4	1.977	1.414	28.5	

07

FORM VII VOA 1/87 Rev.

DATA VALIDATION FOR
INORGANICS ANALYSES:
U.S. EPA CASE NO. 9688
RIDGEFIELD BRICK AND TILE

This report presents the data validation for the results from the inorganic analyses of three leachate water samples collected 23 May 1988 at the Ridgefield Brick and Tile Landfill, Ridgefield, WA. The samples were identified as follows:

U.S. EPA Sample No.	Matrix
MJB367	Water
MJB370	Water
MJB371	Water

Inductively coupled plasma spectrophotometry (ICP) analyses were performed on all samples for the elements on the target analyte list (TAL). Furnace atomic absorbtion (AA) analyses were performed for arsenic, lead, selenium, and thallium. Mercury analysis was performed by cold vapor AA (CVAA). No cyanide analysis was performed. All analyses were performed according to U.S. Environmental Protection Agency (U.S. EPA) Contract Laboratory Program (CLP) protocols by Analytical Laboratories, Orange, CA.

DATA QUALIFICATION

The following comments refer to the laboratory performance in meeting the quality control (QC) specification outlined in IFB WA87-K025, IFB WA87-K026, and IFB WA87-K027. The usefulness of the data was evaluated using the criteria presented in U.S. EPA (No date).

Definitions of the qualifiers assigned to sample results are presented at the end of this report in Table 1.

1. SAMPLE HOLDING TIMES

The holding times for the samples were acceptable. The samples were collected 23 May 1988 and were received in the laboratory 25 May 1988. All analyses were completed before 10 June 1988. The mercury preparation and analysis was done 6 June 1988, 14 days after collection.

2. CALIBRATION

The initial and continuing instrument calibrations for both ICP and AA were acceptable. The continuing calibrations and calibration blank analyses were performed at the appropriate intervals. The source of the standards used for all calibrations was U.S. EPA.

Initial and Continuing Calibration - ICP

The initial and continuing calibrations for ICP analysis were performed 9 June 1988. The initial calibration consisted of a calibration blank and four standard solutions. The results from the initial and two continuing calibrations were all within the control limits (90-110 percent). Samples containing concentrations of analytes at 2 times their respective Contract Required Detection Limits (CRDL) were run twice, but results from these runs were not summarized on Form II.

Initial and Continuing Calibration - AA

The initial and continuing calibrations for AA analysis were performed 8 June 1988 for mercury, 9 June 1988 for arsenic and thallium, and 10 June 1988 for lead and selenium. Each calibration run, except that for mercury, included an initial calibration blank and three standards. The mercury calibration run consisted of an initial calibration blank and four standards.

The initial and continuing calibration results for each analyte were within the control limits (90-110 percent).

3. BLANKS

Initial and continuing calibration blanks were run at appropriate intervals for both ICP and AA analyses. A method blank was analyzed for each batch of samples run. No analytes were detected at concentrations greater than the CRDL. The following analytes were detected in the method blank at concentrations greater than 2 times the instrument detection limit (IDL):

Analyte	Concentration (ug/L)
Iron	96.5
Sodium	352.8

The 5-times rule in U.S. EPA (No date) was used to qualify results for these elements detected in the ICP analyses.

4. ICP INTERFERENCE CHECK SAMPLE ANALYSIS

The source of the interference check sample (ICS) was U.S. EPA. Initial and final ICS runs were made. The recovery values reported were within ±20 percent of the true concentration of the element. Small signal responses were noted for potassium and sodium, elements which should not have been present in the ICS solutions. These responses represented concentrations of potassium and sodium that were less than the CRDL.

5. LABORATORY CONTROL SAMPLE ANALYSIS

The lot number of the laboratory control sample (LCS) used was ICV1-5. The results from the analysis of the LCS were all within the ±20 percent criteria.

6. SAMPLE SPECIFIC RESULTS

A duplicate analysis was conducted for sample MJB367. All of the analytes were within the ±20 percent or ±CRDL criteria.

7. SPIKED SAMPLE ANALYSIS

Spiked sample analysis was performed on sample MJB367. The following analytes were found to be outside the percent recovery (%R) control limits (75-125 percent):

Analyte	%R	Qualifier
Lead	41	J
Selenium	14	J
Thallium	24	J

Results for these elements were flagged by the laboratory on Forms I and V with an N. The concentrations were all above the IDL. Positive results for these elements received a J qualifier. If no positive result for these elements was observed, the detection limit was assigned the qualifier UJ, because the results may have been biased low.

8. FURNACE ATOMIC ABSORPTION QC ANALYSIS

Furnace AA raw data were reviewed and all analysis requirements were met and verified. A method of standard additions (MSA) analysis was required for the analysis of lead in sample MJB370, and was performed correctly according to the guidelines. The results of the MSA analysis were within QC criteria, and were flagged by the laboratory with an S on Form VIII.

ICP QC Analysis

Serial dilution analysis was performed on sample MJB367. All of the results were within the guideline criteria of 10 percent difference between initial sample concentration and serial dilution results.

9. SAMPLE RESULT VERIFICATION

The contract required deliverables were complete for this set of data. The reported sample results for the ICP and AA analyses were verified. The reported data are acceptable and concentrations were within the linear range of the ICP, the AA standard calibrations, and the MSA curve for lead. The detection limit reported for selenium (6.0U) on samples MJB367 and MJB370 reflect the 1/10 dilution factor in the AA analysis required for this analyte in these samples.

10. OVERALL ASSESSMENT OF DATA

The inorganic analyses data for this case appear to be complete and in good order. The data are acceptable for use except where assigned a data qualifier. The data qualifiers modify the usefulness of the individual values.

11. REFERENCES

U.S. Environmental Protection Agency. No date. Laboratory data validation functional guidelines for evaluating inorganics analyses. U.S. EPA, Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency. 1987. U.S. EPA Contract Laboratory Program statement of work for inorganics analysis, multi-media multi-concentration. IFB WA-87K025, K026, and K027. U.S. EPA, Washington, DC.

TABLE 1. DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
J	The associated numerical value is an estimated quantity.
UJ	The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
R	The data are unusable. (Analyte may or may not be present). Resampling and reanalysis is necessary for verification.

COPY

FORM I

U.S. EPA Contract Laboratory Program
Sample Management Office
P,O, Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.

MJB367

968810 06

Date 06/13/88

INORGANIC ANALYSIS DATA SHEET

LAB NAME ASSOCIATED LABORATORIES

CASE NO. 9688

SOW NO. 785

Lab Receipt Date 05/25/88

LAB SAMPLE ID. NO. F49090-1

QC REPORT NO. 79

Elements Identified and Measured

Concentration: Low X Medium ____

Matrix: Water X Soil ____ Sludge ____ Other ____

ug/L

1.	Aluminum	61U	P	13.	Magnesium	12400	P
2.	Antimony	23U	P	14.	Manganese	4760	P
3.	Arsenic	3.4U	F	15.	Mercury	0.20 U	CV
4.	Barium	[58]	P	16.	Nickel	13U	P
5.	Beryllium	3.9U	P	17.	Potassium	[1400]	P
6.	Cadmium	4.0U	P	18.	Selenium	6.0U (N) J	F
7.	Calcium	28400	P	19.	Silver	6.4U	P
8.	Chromium	7.9U	P	20.	Sodium	20000	P
9.	Cobalt	[9.5]	P	21.	Thallium	.70U (N) J	F
10.	Copper	25U	P	22.	Vanadium	8.8U	P
11.	Iron	76600	P	23.	Zinc	[19]	P
12.	Lead	12U (N) J	F		Percent Solids (%)		

Cyanide NR

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

CLEAR WATER

Lab Manager Ed Behare

Anytime(

FORM I

COPY

U.S. EPA Contract Laboratory Program
Sample Management Office
P,O, Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.

MJB370

968810 06

Date 06/13/88

INORGANIC ANALYSIS DATA SHEET

LAB NAME ASSOCIATED LABORATORIES CASE NO. 9688

SOW NO. 785 Lab Receipt Date 05/25/88

LAB SAMPLE ID. NO. F49090-2 QC REPORT NO. 79

Elements Identified and Measured

Concentration: Low X Medium ______

Matrix: Water X Soil ______ Sludge ______ Other ______

ug/L

1.	Aluminum	61U	P	13.	Magnesium	10200	P
2.	Antimony	23U	P	14.	Manganese	3270	P
3.	Arsenic	[6.0]	F	15.	Mercury	0.30	CV
4.	Barium	[61]	P	16.	Nickel	[24]	P
5.	Beryllium	3.9U	P	17.	Potassium	[1140]	P
6.	Cadmium	4.0U	P	18.	Selenium	6.0U (N)	F
7.	Calcium	24300	P	19.	Silver	6.4U	P
8.	Chromium	24	P	20.	Sodium	17800	P
9.	Cobalt	[13]	P	21.	Thallium	.70U (N)	F
10.	Copper	25U	P	22.	Vanadium	8.8U	P
11.	Iron	7430	P	23.	Zinc	33	P
12.	Lead	6.1 (N), S	F		Percent Solids (%)		
	Cyanide	NR					

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

CLEAR WATER

Lab Manager Ed Bahare
by Tml

COPY

FORM I

U.S. EPA Contract Laboratory Program
Sample Management Office
P,O, Box 818 - Alexandria, VA 22313
703/557-2490 FTS: 8-557-2490

EPA Sample No.

MJB371

968810 06

Date 06/13/88

INORGANIC ANALYSIS DATA SHEET

LAB NAME ASSOCIATED LABORATORIES

CASE NO. 9688

SOW NO. 785

Lab Receipt Date 05/25/88

LAB SAMPLE ID. NO. F49090-3

QC REPORT NO. 79

Elements Identified and Measured

Concentration: Low X Medium ____

Matrix: Water X Soil ____ Sludge ____ Other ____

ug/L

1.	Aluminum	61U	P	13.	Magnesium	[49]	P
2.	Antimony	23U	P	14.	Manganese	7.8U	P
3.	Arsenic	3.4U	F	15.	Mercury	0.20 U	CV
4.	Barium	2.3U	P	16.	Nickel	13U	P
5.	Beryllium	3.9U	P	17.	Potassium	528U	P
6.	Cadmium	4.0U	P	18.	Selenium	.60U (N)	F
7.	Calcium	[152]	P	19.	Silver	6.4U	P
8.	Chromium	7.9U	P	20.	Sodium	[315] J	P
9.	Cobalt	8.9U	P	21.	Thallium	.70U (N)	F
10.	Copper	25U	P	22.	Vanadium	8.8U	P
11.	Iron	[88] J	P	23.	Zinc	8.7U	P
12.	Lead	5.2 (N)	F		Percent Solids (%)		

Cyanide NR

Footnotes: For reporting results to EPA, standard result qualifiers are used as defined on Cover Page. Additional flags or footnotes explaining results are encouraged. Definition of such flags must be explicit and contained on Cover Page, however.

Comments:

CLEAR WATER

Lab Manager Ed Bechard

ATTACHMENT E

CME WORKSHEETS

RCRA COMPREHENSIVE GROUNDWATER MONITORING EVALUATION

RIDGEFIELD BRICK AND TILE/PACIFIC WOOD TREATING
RIDGEFIELD, WASHINGTON

APPENDIX A

COMPREHENSIVE GROUND-WATER MONITORING EVALUATION WORKSHEET

The following worksheets have been designed to assist the enforcement officer/technical reviewer in evaluating the ground-water monitoring system an owner/operator uses to collect and analyze samples of ground water. The focus of the worksheets is technical adequacy as it relates to obtaining and analyzing representative samples of ground water. The basis of the worksheets is the final RCRA Ground Water Monitoring Technical Enforcement Guidance Document which describes in detail the aspects of ground-water monitoring which EPA deems essential to meet the goals of RCRA.

Appendix A is not a regulatory checklist. Specific technical deficiencies in the monitoring system can, however, be related to the regulations as illustrated in Figure 4.3 taken from the RCRA Ground-Water Monitoring Compliance Order Guide (COG) (included at the end of the appendix). The enforcement officer, in developing an enforcement order, should relate the technical assessment from the worksheets to the regulations using figure 4.3 from the COG as a guide.

I. Office Evaluation - Technical Evaluation of the Design of the Ground-water Monitoring System

A. Review of relevant documents:

1. What documents were obtained prior to conducting the inspection:

a. RCRA Part A permit application? (Y/N) N
b. RCRA Part B permit application? (Y/N) N
c. Correspondence between the owner/operator and appropriate agencies or citizen's groups? (Y/N) Y
d. Previously conducted facility inspection reports? (Y/N) Y
e. Facility's contractor reports? (Y/N) Y
f. Regional hydrogeologic, geologic, or soil reports? (Y/N) N
g. The facility's Sampling and Analysis Plan? (Y/N) Y
h. Ground-water Assessment Program Outline (or Plan, if the facility is in assessment monitoring)? (Y/N) N
i. Other (specify) ______

B. Evaluation of the Owner/Operator's Hydrogeologic Assessment:

1. Did the owner/operator use the following direct techniques in the hydrogeologic assessment:

a. Logs of the soil borings/rock corings (documented by a professional geologist, soil scientist, or geotechnical engineer)? (Y/N) Y
b. Materials tests (e.g., grain size analyses, standard penetration tests, etc.)? (Y/N) Y
c. Piezometer installation for water level measurements at different depths? (Y/N) Y
d. Slug tests? (Y/N) NA - no water in wells

e. Pump tests? (Y/N) NA
f. Geochemical analyses of soil samples? (Y/N) N
g. Other (specify) (e.g., hydrochemical diagrams and wash analysis) ____________________

2. Did the owner/operator use the following indirect techniques to supplement direct techniques data:

a. Geophysical well logs? (Y/N) N
b. Tracer studies? (Y/N) N
c. Resistivity and/or electromagnetic conductance? (Y/N) N
d. Seismic Survey? (Y/N) N
e. Hydraulic conductivity measurements of cores? (Y/N) Y
f. Aerial photography? (Y/N) N
g. Ground penetrating radar? (Y/N) N
h. Other (specify) ____________________

3. Did the owner/operator document and present the raw data from the site hydrogeologic assessment? (Y/N) Y

4. Did the owner/operator document methods (criteria) used to correlate and analyze the information? (Y/N) N

5. Did the owner/operator prepare the following:

a. Narrative description of geology? (Y/N) Y
b. Geologic cross sections? (Y/N) Y
c. Geologic and soil maps? (Y/N) Y
d. Boring/coring logs? (Y/N) Y
e. Structure contour maps of the differing water bearing zones and confining layer? (Y/N) Y - but not for all such layer
f. Narrative description and calculation of groundwater flows? (Y/N) N
g. Water table/potentiometric map? (Y/N) NA - lack of water
h. Hydrologic cross sections? (Y/N) N

6. Did the owner/operator obtain a regional map of the area and delineate the facility? (Y/N) Y

If yes, does this map illustrate:

a. Surficial geology features? (Y/N) Y
b. Streams, rivers, lakes, or wetlands near the facility? (Y/N) Y
c. Discharging or recharging wells near the facility? (Y/N) Y

7. Did the owner/operator obtain a regional hydrogeologic map? (Y/N) N

   If yes, does this hydrogeologic map indicate:

   a. Major areas of recharge/discharge? (Y/N) N
   b. Regional ground-water flow direction? (Y/N) N
   c. Potentiometric contours which are consistent with observed water level elevations? (Y/N) N

8. Did the owner/operator prepare a facility site map? (Y/N) Y

   If yes, does the site map show:

   a. Regulated units of the facility (e.g., landfill areas, impoundments)? (Y/N) Y
   b. Any seeps, springs, streams, ponds, or wetlands? (Y/N) Y
   c. Location of monitoring wells, soil borings, or test pits? (Y/N) Y
   d. How many regulated units does the facility have? 1
      If more than one regulated unit then,
      o Does the waste management area encompass all regulated units? (Y/N) NA
        Or
      o Is a waste management area delineated for each regulated unit? (Y/N) NA

C. Characterization of Subsurface Geology of Site

   1. Soil boring/test pit program:

      a. Were the soil borings/test pits performed under the supervision of a qualified professional? (Y/N) Y
      b. Did the owner/operator provide documentation for selecting the spacing for borings? (Y/N) N
      c. Were the borings drilled to the depth of the first confining unit below the uppermost zone of saturation or ten feet into bedrock? (Y/N) Y
      d. Indicate the method(s) of drilling:
         o Auger (hollow or solid stem) X
         o Mud rotary ___
         o Reverse rotary ___
         o Cable tool ___
         o Jetting ___
         o Other (specify) ___
      e. Were continuous sample corings taken? (Y/N) Y

f. How were the samples obtained (checked method[s])
   o Split spoon X
   o Shelby tube, or similar X
   o Rock coring ____
   o Ditch sampling ____
   o Other (explain) ____

g. Were the continuous sample corings logged by a qualified professional in geology? (Y/N) Y

h. Does the field boring log include the following information:
   o Hole name/number? (Y/N) Y
   o Date started and finished? (Y/N) N- not finish date
   o Driller's name? (Y/N) Y
   o Hole location (i.e., map and elevation)? (Y/N) N
   o Drill rig type and bit/auger size? (Y/N) Y
   o Gross petrography (e.g., rock type) of each geologic unit? (Y/N) Y
   o Gross mineralogy of each geologic unit? (Y/N) Y
   o Gross structural interpretation of each geologic unit and structural features (e.g., fractures, gouge material, solution channels, buried streams or valleys, identification of depositional material)? (Y/N) Y
   o Development of soil zones and vertical extent and description of soil type? (Y/N) Y
   o Depth of water bearing unit(s) and vertical extent of each? (Y/N) NA
   o Depth and reason for termination of borehole? (Y/N) N - not reason
   o Depth and location of any contaminant encountered in borehole? (Y/N) NA
   o Sample location/number? (Y/N) Y
   o Percent sample recovery? (Y/N) N
   o Narrative descriptions of:
      -- Geologic observations? (Y/N) Y
      -- Drilling observations? (Y/N) Y

i. Were the following analytical tests performed on the core samples:
   o Mineralogy (e.g., microscopic tests and x-ray diffraction)? (Y/N) N
   o Petrographic analysis:
      - degree of crystallinity and cementation of matrix? (Y/N) N
      - degree of sorting, size fraction (i.e., sieving), textural variations? (Y/N) Y

- rock type(s)? (Y/N) N
- soil type? (Y/N) N
- approximate bulk geochemistry? (Y/N) N
- existence of microstructures that may effect or indicate fluid flow? (Y/N) Y

o Falling head tests? (Y/N) N
o Static head tests? (Y/N) Y
o Settling measurements? (Y/N) N
o Centrifuge tests? (Y/N) N
o Column drawings? (Y/N) N

D. Verification of subsurface geological data

1. Has the owner/operator used indirect geophysical methods to supplement geological conditions between borehole locations? (Y/N) N
2. Do the number of borings and analytical data indicate that the confining layer displays a low enough permeability to impede the migration of contaminants to any stratigraphically lower water-bearing units? (Y/N) NOT YET DETERMINED
3. Is the confining layer laterally continuous across the entire site? (Y/N) Y
4. Did the owner/operator consider the chemical compatibility of the site-specific waste types and the geologic materials of the confining layer? (Y/N) Y
5. Did the geologic assessment address or provide means for resolution of any information gaps of geologic data? (Y/N) N
6. Do the laboratory data corroborate the field data for petrography? (Y/N) N
7. Do the laboratory data corroborate the field data for mineralogy and subsurface geochemistry? (Y/N) N

E. Presentation of geologic data

1. Did the owner/operator present geologic cross sections of the site? (Y/N) Y
2. Do cross sections:
   a. identify the types and characteristics of the geologic materials present? (Y/N) Y
   b. define the contact zones between different geologic materials? (Y/N) Y
   c. note the zones of high permeability or fracture? (Y/N) Y
   d. give detailed borehole information including:
      o location of borehole? (Y/N) Y
      o depth of termination? (Y/N) Y
      o location of screen (if applicable)? (Y/N) Y
      o depth of zone(s) of saturation? (Y/N) N
      o backfill procedure? (Y/N) N

3. Did the owner/operator provide a topographic map which was constructed by a licensed surveyor? (Y/N) Y
4. Does the topographic map provide:
   a. contours at a maximum interval of two-feet? (Y/N) N
   b. locations and illustrations of man-made features (e.g., parking lots, factory buildings, drainage ditches, storm drains, pipelines, etc.)? (Y/N) Y
   c. descriptions of nearby water bodies? (Y/N) Y
   d. descriptions of off-site wells? (Y/N) Y
   e. site boundaries? (Y/N) Y
   f. individual RCRA units? (Y/N) Y
   g. delineation of the waste management area(s)? (Y/N) Y
   h. well and boring locations? (Y/N) Y
5. Did the owner/operator provide an aerial photograph depicting the site and adjacent off-site features? (Y/N) N
6. Does the photograph clearly show surface water bodies, adjacent municipalities, and residences and are these clearly labelled? (Y/N) N

F. Identification of Ground-Water Flowpaths

1. Ground-water flow direction

   a. Was the well casing height measured by a licensed surveyor to the nearest 0.01 feet? (Y/N) N
   b. Were the well water level measurements taken within a 24 hour period? (Y/N) Y
   c. Were the well water level measurements taken to the nearest 0.01 feet? (Y/N) Y
   d. Were the well water levels allowed to stabilize after construction and development for a minimum of 24 hours prior to measurements? (Y/N) Y
   e. Was the water level information obtained from (check appropriate one):
      - o multiple piezometers placed in single borehole? ______
      - o vertically nested piezometers in closely spaced separate boreholes? ______
      - o monitoring wells X

f. Did the owner/operator provide construction details for the piezometers? (Y/N) Y

g. How were the static water levels measured (check method(s).
- o Electric water sounder X
- o Wetted tape ____
- o Air line ____
- o Other (explain) ____

____

h. Was the well water level measured in wells with equivalent screened intervals at an equivalent depth below the saturated zone? (Y/N) Y

i. Has the owner/operator provided a site water table (potentiometric) contour map? If yes, (Y/N) N
- o Do the potentiometric contours appear logical and accurate based on topography and presented data? (Consult water level data) (Y/N) ____
- o Are ground-water flow-lines indicated? (Y/N) ____
- o Are static water levels shown? (Y/N) ____
- o Can hydraulic gradients be estimated? (Y/N) ____

NOT ENOUGH WATER IN WELLS TO DETERMINE

j. Did the owner/operator develop hydrologic cross sections of the vertical flow component across the site using measurements from all wells? (Y/N) N

k. Do the owner/operator's flow nets include:
- o piezometer locations? (Y/N) ____
- o depth of screening? (Y/N) ____
- o width of screening? (Y/N) ____
- o measurements of water levels from all wells and piezometers? (Y/N) ____

NO FLOW NETS

2. Seasonal and temporal fluctuations in ground-water level

a. Do fluctuations in static water levels occur? (Y/N) Y
- o If yes, are the fluctuations caused by any of the following:

-- Off-site well pumping (Y/N) N

-- Tidal processes or other intermittent natural variations (e.g., river stage, etc.) (Y/N) N

-- On-site well pumping (Y/N) N

-- Off-site, on-site construction or changing land use patterns (Y/N) N

-- Deep well injection (Y/N) N

-- Seasonal variations (Y/N) Y

-- Other (specify) Potential influence from nearby septic tank.

b. Has the owner/operator documented sources and patterns that contribute to or affect the ground-water patterns below the waste management? (Y/N) N

c. Do water level fluctuations alter the general ground-water gradients and flow directions? (Y/N) NOT DETERMINED

d. Based on water level data, do any head differentials occur that may indicate a vertical flow component in the saturated zone? (Y/N)

e. Did the owner/operator implement means for gauging long term effects on water movement that may result from on-site or off-site construction or changes in land-use patterns? (Y/N)

3. Hydraulic conductivity

a. How were hydraulic conductivities of the subsurface materials determined?
   - o Single-well tests (slug tests)? (Y/N) N
   - o Multiple-well tests (pump tests) (Y/N) N
   - o Other (specify)

b. If single-well tests were conducted, was it done by:
   - o Adding or removing a known volume of water, or (Y/N) NA
   - o Pressurizing well casing (Y/N)

c. If single well tests were conducted in a highly permeable formation, were pressure transducers and high-speed recording equipment used to record the rapidly changing water levels? (Y/N)

d. Since single well tests only measure hydraulic conductivity in a limited area, were enough tests run to ensure a representative measure of conductivity in each hydrogeologic unit? (Y/N)

e. Is the owner/operator's slug test data (if applicable) consistent with existing geologic information (e.g., boring logs)? (Y/N)

f. Were other hydraulic conductivity properties determined? (Y/N) Y

g. If yes, provide any of the following data, if available:
   - o Transmissivity ____
   - o Storage coefficient ____
   - o Leakage ____
   - o Permeability X ← LABORATORY TESTS
   - o Porosity ____
   - o Specific capacity ____
   - o Other (specify) ____

4. Identification of the uppermost aquifer

a. Has the extent of the uppermost saturated zone (aquifer) in the facility area been defined? If yes, (Y/N) N
   - o Are soil boring/test pit logs included? (Y/N) NA
   - o Are geologic cross-sections included? (Y/N) NA

b. Is there evidence of confining (competent, unfractured, continuous, and low permeability) layers beneath the site? (Y/N) Y
   - o If yes, how was continuity demonstrated?
     Boreholes

c. What is hydraulic conductivity of the confining unit (if present)? 9×10^{-6} to 7×10^{-5} CM/Sec
   How was it determined? LAB TESTS

d. Does potential for other hydraulic communication exist (e.g., lateral incontinuity between geologic units, facies changes, fracture zones, cross cutting structures, or chemical corrosion/alteration of geologic units by leachage? (Y/N) N
   If yes or no what is the rationale? ________

G. Office Evaluation of the Facility's Ground-Water Monitoring System

Monitoring Well Design and Construction:
These questions should be answered for each different well design present at the facility.

1. Drilling Methods

a. What drilling method was used for the well?
   - o Hollow-stem auger X
   - o Solid-stem auger ____
   - o Mud rotary ____
   - o Air rotary ____
   - o Reverse rotary ____
   - o Cable tool ____
   - o Jetting ____
   - o Air drill with casing hammer ____
   - o Other (specify) ____

b. Were any cutting fluids (including water) or additives used during drilling? (Y/N) N
   If yes, specify
   Type of drilling fluid ________
   Source of water used ________
   Foam ________
   Polymers ________
   Other ________

c. Was the cutting fluid, or additive, identified? (Y/N) NA

d. Was the drilling equipment steam-cleaned prior to drilling the well? (Y/N) INFORMATION NOT PROVIDED

Other methods ____________________

e. Was compressed air used during drilling? (Y/N) N

o If yes, was the air filtered to remove oil? (Y/N) NA

f. Did the owner/operator document procedure for establishing the potentiometric surface? (Y/N) N

o If yes, how was the location established?

____

g. Formation samples

o Were formation samples collected initially during drilling? (Y/N) Y

o Were any cores taken continuous? (Y/N) Y

If not, at what interval were samples taken? ____________________

o How were the samples obtained?

- Split spoon X
- Shelby tube X
- Core drill ____
- Other (specify) ____________________

o Identify if any physical and/or chemical tests were performed on the formation samples (specify) MOISTURE CONTENT, GRAIN SIZE, PERMEABILITY

2. Monitoring Well Construction Materials

a. Identify construction materials (by number) and diameters (ID/OD)

	Material	Diameter (ID/OD)
o Primary Casing	PVC	
o Secondary or outside casing (double construction)		
o Screen	PVC	

b. How are the sections of casing and screen connected?

o Pipe sections threaded ____ NOT DETERMINED

o Couplings (friction) with adhesive or solvent ____

o Couplings (friction) with retainer screws ____

o Other (specify) ____________________

c. Were the materials steam-cleaned prior to installation? (Y/N) ___ N.D.
   If no, how were the materials cleaned? ______

3. Well Intake Design and Well Development

   a. Was a well intake screen installed? (Y/N) Y
      o What is the length of the screen for the well? 5-10 ft
      o Is the screen manufactured? (Y/N) Y
   b. Was a filter pack installed? (Y/N) Y
      o What kind of filter pack was employed? SAND
      o Is the filter pack compatible with formation materials? (Y/N) Not Determined
      o How was the filter pack installed? ______
      o What are the dimensions of the filter pack? ______
      o Has a turbidity measurement of the well water ever been made? (Y/N) ___
      o Have the filter pack and screen been designed for the in situ materials? (Y/N) ___
   c. Well development
      Was the well developed? (Y/N) ___
      o What technique was used for well development?
        - Surge block ___
        - Bailer ___
        - Air surging ___
        - Water pumping ___
        - Other (specify) ______

4. Annular Space Seals

   a. What is the annular space in the saturated zone directly above the filter pack filled with?
      - Sodium bentonite (specify type and grit) type and grit unknown
      - Cement (specify neat or concrete) ______
      - Other (specify) ______
      o Was the seal installed by? NOT DETERMINED
        - Dropping material down the hole and tamping ___
        - Dropping material down the inside of hollow-stem auger ___
        - Tremie pipe method ___
        - Other (specify) ___
   b. Was a different seal used in the unsaturated zone? (Y/N) unknown
      If yes,
      o Was this seal made with?
        - Sodium bentonite (specify type and grit) ______
        - Cement (specify neat or concrete) ______
        - Other (specify) ______

o Was this seal installed by?
- Dropping material down the hole and tamping ______ ND
- Dropping material down the inside of hollow stem auger ______
- Other (specify) ______________________ ______

c. Is the upper portion of the borehole sealed with a concrete cap to prevent infiltration from the surface? (Y/N) Y

d. Is the well fitted with an above-ground protective device and bumper guards? (Y/N) Y

e. Has the protective cover been installed with locks to prevent tampering (Y/N) Y

H. Evaluation of the Facility's Detection Monitoring Program

1. Placement of Downgradient Detection Monitoring Wells

a. Are the ground-water monitoring wells or clusters located immediately adjacent to the waste management area? (Y/N) Y

b. How far apart are the detection monitoring wells?
Typically 80 – 200 ft

c. Does the owner/operator provide a rationale for the location of each monitoring well or cluster? (Y/N) N

d. Has the owner/operator identified the well screen lengths of each monitoring well or clusters? (Y/N) Y

e. Does the owner/operator provide an explanation for the well screen lengths of each monitoring well or cluster? (Y/N) N

f. Do the actual locations of monitoring wells or clusters correspond to those identified by the owner/operator? (Y/N) Y

2. Placement of Upgradient Monitoring Wells

a. Has the owner/operator documented the location of each upgradient monitoring well or cluster? (Y/N) N (HAVE NOT identified flow direction)

b. Does the owner/operator provide an explanation for the location(s) of the upgradient monitoring wells? (Y/N) NA

c. What length screen has the owner/operator employed in the background monitoring well(s)?

d. Does the owner/operator provide an explanation for the screen length(s) chosen? (Y/N) ______

e. Does the actual location of each background monitoring well or cluster correspond to that identified by the owner/operator? (Y/N) ______

Wells not producing sufficient water to sample. ∴ this whole section is NA. Also, no plan as such exists

I. Office Evaluation of the Facility's Assessment Monitoring Program

1. Does the assessment plan specify:
   a. The number, location, and depth of wells? (Y/N) ___
   b. The rationale for their placement and identify the basis that will be used to select subsequent sampling locations and depths in later assessment phases? (Y/N) ___
2. Does the list of monitoring parameters include all hazardous waste constituents from the facility? (Y/N) ___
   a. Does the water quality parameter list include other important indicators not classified as hazardous waste constituents? (Y/N) ___
   b. Does the owner/operator provide documentation for the listed wastes which are not included? (Y/N) ___
3. Does the owner/operator's assessment plan specify the procedures to be used to determine the rate of constituent migration in the ground-water? (Y/N) ___
4. Has the owner/operator specified a schedule of implementation in the assessment plan? (Y/N) ___
5. Have the assessment monitoring objectives been clearly defined in the assessment plan? (Y/N) ___
   a. Does the plan include analysis and/or re-evaluation to determine if significant contamination has occurred in any of the detection monitoring wells? (Y/N) ___
   b. Does the plan provide for a comprehensive program of investigation to fully characterize the rate and extent of contaminant migration from the facility? (Y/N) ___
   c. Does the plan call for determining the concentrations of hazardous wastes and hazardous waste constituents in the ground water? (Y/N) ___
   d. Does the plan employ a quarterly monitoring program? (Y/N) ___
6. Does the assessment plan identify the investigatory methods that will be used in the assessment phase? (Y/N) ___
   a. Is the role of each method in the evaluation fully described? (Y/N) ___
   b. Does the plan provide sufficient descriptions of the direct methods to be used? (Y/N) ___
   c. Does the plan provide sufficient descriptions of the indirect methods to be used? (Y/N) ___
   d. Will the method contribute to the further characterization of the contaminant movement? (Y/N) ___
7. Are the investigatory techniques utilized in the assessment program based on direct methods? (Y/N) ___
   a. Does the assessment approach incorporate indirect methods to further support direct methods? (Y/N) ___
   b. Will the planned methods called for in the assessment approach ultimately meet performance standards for assessment monitoring? (Y/N) ___

c. Are the procedures well defined? (Y/N) ___ NA
d. Does the approach provide for monitoring wells similar in design and construction as the detection monitoring wells? (Y/N) ___
e. Does the approach employ taking samples during drilling or collecting core samples for further analysis? (Y/N) ___

8. Are the indirect methods to be used based on reliable and accepted geophysical techniques? (Y/N) ___
   a. Are they capable of detecting subsurface changes resulting from contaminant migration at the site? (Y/N) ___
   b. Is the measurement at an appropriate level of sensitivity to detect ground-water quality changes at the site? (Y/N) ___
   d. Is the method appropriate considering the nature of the subsurface materials? (Y/N) ___
   e. Does the approach consider the limitations of these methods? (Y/N) ___
   f. Will the extent of contamination and constituent concentration be based on direct methods and sound engineering judgment? (Using indirect methods to further substantiate the findings) (Y/N) ___

9. Does the assessment approach incorporate any mathematical modeling to predict contaminant movement? (Y/N) ___
   a. Will site specific measurements be utilized to accurately portray the subsurface? (Y/N) ___
   b. Will the derived data be reliable? (Y/N) ___
   c. Have the assumptions been identified? (Y/N) ___
   d. Have the physical and chemical properties of the site-specific wastes and hazardous waste constituents been identified? (Y/N) ___

J. Conclusions

1. Subsurface geology

   a. Has sufficient data been collected to adequately define petrography and petrographic variation? (Y/N) NA
   b. Has the subsurface geochemistry been adequately defined? (Y/N) N
   c. Was the boring/coring program adequate to define subsurface geologic variation? (Y/N) Y – At least the top of the Troutdale Formation
   d. Was the owner/operator's narrative description complete and accurate in its interpretation of the data? (Y/N) N
   e. Does the geologic assessment address or provide means to resolve any information gaps? (Y/N) N

2. Ground-water flowpaths

a. Did the owner/operator adequately establish the horizontal and vertical components of ground-water flow? (Y/N) N
b. Were appropriate methods used to establish ground-water flowpaths? (Y/N) NA
c. Did the owner/operator provide accurate documentation? (Y/N) NA
d. Are the potentiometric surface measurements valid? (Y/N) NA
e. Did the owner/operator adequately consider the seasonal and temporal effects on the ground-water? (Y/N) N
f. Were sufficient hydraulic conductivity tests performed to document lateral and vertical variation in hydraulic conductivity in the entire hydrogeologic subsurface below the site? (Y/N) N

3. Uppermost aquifer

a. Did the owner/operator adequately define the uppermost aquifer? (Y/N) N

4. Monitoring Well Construction and Design

a. Do the design and construction of the owner/operator's ground-water monitoring wells permit depth discrete ground-water samples to be taken? (Y/N) NA
b. Are the samples representative of ground-water quality? (Y/N) ____
c. Are the ground-water monitoring wells structurally stable? (Y/N) ____
d. Does the ground-water monitoring well's design and construction permit an accurate assessment of aquifer characteristics? (Y/N) √

5. Detection Monitoring

a. Downgradient Wells
Do the location, and screen lengths of the ground-water monitoring wells or clusters in the detection monitoring system allow the immediate detection of a release of hazardous waste or constituents from the hazardous waste management area to the uppermost aquifer? (Y/N) NA

b. Upgradient Wells
Do the location and screen lengths of the upgradient (background) ground-water monitoring wells ensure the capability of collecting ground-water samples representative of upgradient (background) ground-water quality including any ambient heterogenous chemical characteristics? (Y/N) ____

2. Is the upper portion of the borehole sealed with concrete to prevent infiltration from the surface? (Y/N) Y

3. Is the well fitted with an above-ground protective device? (Y/N) Y

4. Is the protective cover fitted with locks to prevent tampering? (Y/N) Y

If a facility utilizes more than a single well design, answer the above questions for each well design.

III. Review of Sample Collection Procedures

A. Measurement of well depths elevation:

1. Are measurements of both depth to standing water and depth to the bottom of the well made? (Y/N) Y

2. Are measurements taken to the 0.01 feet? (Y/N) Y

3. What device is used?

Electric water sounder

4. Is there a reference point established by a licensed surveyor? (Y/N) N

5. Is the measuring equipment properly cleaned between well locations to prevent cross contamination? (Y/N) N

B. Detection of immiscible layers:

1. Are procedures used which will detect light phase immiscible layers? (Y/N) N

2. Are procedures used which will detect heavy phase immiscible layers? (Y/N) N

C. Sampling of immiscible layers:

1. Are the immiscible layers sampled separately prior to well evacuation? (Y/N) NA

2. Do the procedures used minimize mixing with water soluble phases? (Y/N) ↓

D. Well evacuation:

1. Are low yielding wells evacuated to dryness? (Y/N) NA - no water

2. Are high yielding wells evacuated so that at least three casing volumes are removed? (Y/N) ↓

3. What device is used to evacuate the wells?

____

4. If any problems are encountered (e.g., equipment malfunction) are they noted in a field logbook? (Y/N) NA

E. Sample withdrawal:

1. For low yielding wells, are samples for volatiles, pH, and oxidation/reduction potential drawn first after the well recovers? (Y/N) NA

2. Are samples withdrawn with either flurocarbon/resins or stainless steel (316, 304 or 2205) sampling devices? (Y/N) ___

3. Are sampling devices either bottom valve bailers or positive gas displacement bladder pumps? (Y/N) ___

4. If bailers are used, is fluorocarbon/resin coated wire, single strand stainless steel wire, or monofilament used to raise and lower the bailer? (Y/N) ___

5. If bladder pumps are used, are they operated in a continuous manner to prevent aeration of the sample? (Y/N) ___

6. If bailers are used, are they lowered slowly to prevent degassing of the water? (Y/N) ___

7. If bailers are used, are the contents transferred to the sample container in a way that minimizes agitation and aeration? (Y/N) ___

8. Is care taken to avoid placing clean sampling equipment on the ground or other contaminated surfaces prior to insertion into the well? (Y/N) ___

9. If dedicated sampling equipment is not used, is equipment disassembled and thoroughly cleaned between samples? (Y/N) ___

10. If samples are for inorganic analysis, does the cleaning procedure include the following sequential steps:
    a. Dilute acid rinse (HNO_3 or HCl)? (Y/N) ___

11. If samples are for organic analysis, does the cleaning procedure include the following sequential steps:
    a. Nonphosphate detergent wash? (Y/N) ___
    b. Tap water rinse? (Y/N) ___

c. Distilled/deionized water rinse? (Y/N) NA
d. Acetone rinse? (Y/N)
e. Pesticide-grade hexane rinse? (Y/N)

12. Is sampling equipment thoroughly dry before use? (Y/N)

13. Are equipment blanks taken to ensure that sample cross-contamination has not occurred? (Y/N)

14. If volatile samples are taken with a positive gas displacement bladder pump, are pumping rates below 100 ml/min? (Y/N)

F. In-situ or field analyses:

1. Are the following labile (chemically unstable) parameters determined in the field:
   a. pH? (Y/N) Y
   b. Temperature? (Y/N) Y
   c. Specific conductivity? (Y/N) Y
   d. Redox potential? (Y/N) N
   e. Chlorine? (Y/N) N
   f. Dissolved oxygen? (Y/N) N
   g. Turbidity? (Y/N) N
   h. Other (specify) ______________________

   on toe drain samples

2. For in-situ determinations, are they made after well evacuation and sample removal? (Y/N) NA

3. If sample is withdrawn from the well, is parameter measured from a split portion? (Y/N)

4. Is monitoring equipment calibrated according to manufacturers' specifications and consistent with SW-846? (Y/N)

5. Is the date, procedure, and maintenance for equipment calibration documented in the field logbook? (Y/N)

IV. Review of Sample Preservation and Handling Procedures

A. Sample containers:

1. Are samples transferred from the sampling device directly to their compatible containers? (Y/N) N

2. Are sample containers for metals (inorganics) analyses polyethylene with polypropylene caps? (Y/N) Y

3. Are sample containers for organics analysis glass bottles with fluorocarbonresin-lined caps? (Y/N) Y

4. If glass bottles are used for metals samples are the caps fluorocarbonresin-lined? (Y/N) NA

5. Are the sample containers for metal analyses cleaned using these sequential steps? NOT DETERMINED
   a. Nonphosphate detergent wash? (Y/N) ___
   b. 1:1 nitric acid rinse? (Y/N) ___
   c. Tap water rinse? (Y/N) ___
   d. 1:1 hydrochloric acid rinse? (Y/N) ___
   e. Tap water rinse? (Y/N) ___
   f. Distilled/deionized water rinse? (Y/N) ___

6. Are the sample containers for organic analyses cleaned using these sequential steps?
   a. Nonphosphate detergent/hot water wash? (Y/N) ___
   b. Tap water rinse? (Y/N) ___
   c. Distilled/deionized water rinse? (Y/N) ___
   d. Acetone rinse? (Y/N) ___
   e. Pesticide-grade hexane rinse? (Y/N) ___

7. Are trip blanks used for each sample container type to verify cleanliness? (Y/N) ___

B. Sample preservation procedures:

1. Are samples for the following analyses cooled to 4°C: NOT DETERMIN[ED]
   a. TOC? (Y/N) ___
   b. TOX? (Y/N) ___
   c. Chloride? (Y/N) ___
   d. Phenols? (Y/N) ___
   e. Sulfate? (Y/N) ___
   f. Nitrate? (Y/N) ___
   g. Coliform bacteria? (Y/N) ___
   h. Cyanide? (Y/N) ___
   i. Oil and grease? (Y/N) ___
   j. Hazardous constituents (§261, Appendix VIII)? (Y/N) ___

2. Are samples for the following analyses field acidified to pH <2 with HNO_3:
   a. Iron? (Y/N) ___
   b. Manganese? (Y/N) ___
   c. Sodium? (Y/N) ___
   d. Total metals? (Y/N) ___
   e. Dissolved metals? (Y/N) ___
   f. Fluoride? (Y/N) ___
   g. Endrin? (Y/N) ___
   h. Lindane? (Y/N) ___
   i. Methoxychlor? (Y/N) ___
   j. Toxaphene? (Y/N) ___

NA

k. 2,4, D? (Y/N) ___
l. 2,4,5, TP Silvex? (Y/N) ___
m. Radium? (Y/N) ___
n. Gross alpha? (Y/N) ___
o. Gross beta? (Y/N) ___

3. Are samples for the following analyses field acidified to pH <2 with H_2SO_4: (Y/N) ___
   a. Phenols? (Y/N) ___
   b. Oil and grease? (Y/N) ___

4. Is the sample for TOC analyses field acidified to pH <2 with HCl? (Y/N) ___

5. Is the sample for TOX analysis preserved with 1 ml of 1.1 M sodium sulfite? (Y/N) ___

6. Is the sample for cyanide analysis preserved with NaOH to pH >12? (Y/N) ___

C. Special handling considerations:
1. Are organic samples handled without filtering? (Y/N) ___

2. Are samples for volatile organics transferred to the appropriate vials to eliminate headspace over the sample? (Y/N) ___

3. Are samples for metal analysis split into two portions? (Y/N) ___

4. Is the sample for dissolved metals filtered through a 0.45 micron filter? (Y/N) ___

5. Is the second portion not filtered and analyzed for total metals? (Y/N) ___

6. Is one equipment blank prepared each day of ground-water sampling? (Y/N) ___

V. Review of Chain-of-Custody Prodecures

A. Sample labels
1. Are sample labels used? (Y/N) ___

2. Do they provide the following information:
   a. Sample identification number? (Y/N) ___
   b. Name of collector? (Y/N) ___
   c. Date and time of collection? (Y/N) ___
   d. Place of collection? (Y/N) ___
   e. Parameter(s) requested and preservatives used? (Y/N) ___

3. Do they remain legible even if wet? (Y/N) ___ NA

B. Sample seals:
   1. Are sample seals placed on those containers to ensure the samples are not altered? (Y/N) ___

C. Field logbook:
   1. Is a field logbook maintained? (Y/N) ___

   2. Does it document the following:
      a. Purpose of sampling (e.g., detection or assessment)? (Y/N) ___
      b. Location of well(s)? (Y/N) ___
      c. Total depth of each well? (Y/N) ___
      d. Static water level depth and measurement technique? (Y/N) ___
      e. Presence of immiscible layers and detection method? (Y/N) ___
      f. Collection method for immiscible layers and sample identification numbers? (Y/N) ___
      g. Well evacuation procedures? (Y/N) ___
      h. Sample withdrawal procedure? (Y/N) ___
      i. Date and time of collection? (Y/N) ___
      j. Well sampling sequence? (Y/N) ___
      k. Types of sample containers and sample identification number(s)? (Y/N) ___
      l. Preservative(s) used? (Y/N) ___
      m. Parameters requested? (Y/N) ___
      n. Field analysis data and method(s)? (Y/N) ___
      o. Sample distribution and transporter? (Y/N) ___
      p. Field observations? (Y/N) ___
         o Unusual well recharge rates? (Y/N) ___
         o Equipment malfunction(s)? (Y/N) ___
         o Possible sample contamination? (Y/N) ___
         o Sampling rate? (Y/N) ___

D. Chain-of-custody record:
   1. Is a chain-of-custody record included with each sample? (Y/N) ___
   2. Does it document the following:
      a. Sample number? (Y/N) ___
      b. Signature of collector? (Y/N) ___
      c. Date and time of collection? (Y/N) ___
      d. Sample type? (Y/N) ___
      e. Station location? (Y/N) ___
      f. Number of containers? (Y/N) ___
      g. Parameters requested? (Y/N) ___
      h. Signatures of persons involved in the chain-of-possession? (Y/N) ___ (Y/N) ___
      i. Inclusive dates of possession? (Y/N) ___

E. Sample analysis request sheet:
   1. Does a sample analysis request sheet accompany each sample? (Y/N) ___ NA

   2. Does the request sheet document the following:
      a. Name of person receiving the sample? (Y/N) ___
      b. Date of sample receipt? (Y/N) ___
      c. Laboratory sample number (if different than field number)? (Y/N) ___
      d. Analyses to be performed? (Y/N) ___

VI. Review of Quality Assurance/Quality Control

A. Is the validity and reliability of the laboratory and field generated data ensured by a QA/QC program? (Y/N) ___

B. Does the QA/QC program include:
   1. Documentation of any deviations from approved procedures? (Y/N) ___

   2. Documentation of analytical results for:
      a. Blanks? (Y/N) ___
      b. Standards? (Y/N) ___
      c. Duplicates? (Y/N) ___
      d. Spiked samples? (Y/N) ___
      e. Detectable limits for each parameter being analyzed? (Y/N) ___

C. Are approved statistical methods used? (Y/N) ___

D. Are QC samples used to correct data? (Y/N) ___

E. Are all data critically examined to ensure it has been properly calculated and reported? (Y/N) ___

VII. Surficial Well Inspection and Field Observation

A. Are the wells adequately maintained? (Y/N) Y

B. Are the monitoring wells protected and secure? (Y/N) Y

C. Do the wells have surveyed casing elevations? (Y/N) Y

D. Are the ground-water samples turbid? (Y/N) Y

E. Have all physical characteristics of the site been noted in the inspector's field notes (i.e., surface waters, topography, surface features)? (Y/N) Y

F. Has a site sketch been prepared by the field inspector with a scale, north arrow, location(s) of buildings, location(s) of regulated units, location of monitoring wells, and a rough depiction of the site drainage pattern? (Y/N) N

VIII. Conclusions

A. Is the facility currently operating under the correct monitoring program according to the statistical analyses performed by the current operator? (Y/N) NA - no analyses of GW

B. Does the ground-water monitoring system, as designed and operated, allow for detection or assessment of any possible ground-water contamination caused by the facility? (Y/N) N

C. Does the sampling and analysis procedures permit the owner/operator to detect and, where possible, assess the nature and extent of a release of hazardous constituents to ground water from the monitored hazardous waste management facility? (Y/N) N